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A QUARTERLY

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Tommaso Alghisi: Florentine Lithotomist (1669-1713)

RALPH R. LANDES*

To the left of the apse in the Badia Fiorentino, one of the most ancient of the churches of Florence, is the burial vault inscribed "De Alghisis," proudly situated among those of the most illustrious families of the city—the Pandolfini, Ricci, Strozzi, Sforza, and Nelli—indicating the lofty social status of the Alghisi family in the thirteenth and fourteenth centuries. The family was in eclipse for several centuries, owing possibly to a decline in fortune and political favor, until we find mention again of a Ludovico Alghisi, surgeon of Florence, who lived in the late sixteenth and early seventeenth century.

From this family sprang Giorgio and Tommaso Alghisi,[1] father and son, surgeons of Florence. Giorgio Alghisi was born about 1625. This date is speculative but is arrived at from the knowledge that by 1700 he had already practised as surgeon and master surgeon at the Santa Maria Nuova Hospital for fifty years,[2] and it is logical to suppose that he would have been about twenty-five years old at the time of his appointment to the staff.

While still a young man he married Giovanna Querci, the daughter of Ghiarissimo Querci. Three daughters were born of this union. Giorgio became a widower when rather young. He remarried in 1669, taking as his wife Maria Caterina Compani. On October 17th of the same year, Tommaso, the first of the four children of this marriage, was born.[3]

On 22 March 1676, Giorgio bought a house situated in the Via del Corno, directly behind the palace of the Signoria, from the brothers Ser Raffaello and Ser Paolo Rinaldi for the sum of 1160 scudi.[4] Apparently these were prosperous days for Giorgio, since he and his family occupied the entire large house. But more meager days followed, and he found it necessary to rent a room to a Carlo

* Danville, Virginia.

1 Not to be confused with the Tommaso Alghisi who translated Nannoni's *Idrocele* (1779). He was a Venetian or Paduan and unrelated to our subject.

2 Arch. dell'Ospedale S. Maria Nuova. Libro Ricordanza Registro no. 56. Libro G. 1690-1714. Nov. 4, 1699.

3 Arch. dell'opera di S. Maria del Fiore, Libri Sacramentali de' Battesimi. Reg. dei Battezzati Maschi 1669, c. 167. Partita no. 1363.

4 Arch. Firenze, Decime granducali. Arroti 1677. Quartiere S. Croce, Ganfalone Carro. Reg. no. 1443.

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Paci in 1683[5]; in 1699 he rented the entire first floor to Giovanni Maria Marchini, a coachman to the Grand Duke of Tuscany.[6] We have a rather detailed description of the family quarters.[7] There was a large room used as a living and dining room, rather well furnished with some good paintings and other objects of art. Another well-furnished room, overlooking the kitchen-garden and containing a large number of pictures and other valuable items, was probably occupied by the two sons, Tommaso and Girolamo. A third bedroom was used by the two unmarried daughters. Several small rooms containing many surgical instruments were used by Giorgio for the examination and treatment of his private patients. The servants' quarters were very poorly furnished, as was the kitchen. There was a terrace and a loggia used as a storage space for odds and ends.

We know only scraps about Giorgio but gain the impression that he was a hard-working, dependable, and conservative individual. An entry in the hospital's daily log on 15 January 1656 makes note of "the good fame, the very good quality and worthiness of Signor Giorgio di Giovanni Alghisi" and of his appointment to the hospital staff to "treat daily those patients assigned to him" and to participate in the examination of apprentices "with the stipulation that he could not and would not expect a salary, subsistence nor compensation of any sort."[8] On 4 September 1675 —nineteen years later— a note is made that Professor Giorgio Alghisi, "having given continuous and diligent service to the hospital for such a long time is assigned an annual subsistence of 20 cubic meters of wheat, 12 barrels of wine and one barrel of olive oil."[9] He was also entitled to have meals at the hospital and to attend private patients for which he collected his own fees. Giorgio was a daring surgeon on at least one occasion, for he is recorded by his son Tommaso as having removed from a man's knee joint a great many rice-sized "calculi." As professor of surgery he was obliged to visit his patients daily, to respond at any hour to patients requiring emergency care, to lecture twice weekly to the apprentices or more often if necessary in the absence of other lecturers due to illness or for other causes, to take part in the examination of apprentices,

[5] *Ibid.*, Arroti 1683. Reg. no. 2449. No. 14. c. 28.

[6] *Ibid.*, Corda 2474. Arroti 1700. No. 28. c. 78.

[7] Arch. Notarile Moderno. Reg. no. 2685/7. 1702-1704, c. 46.

[8] Arch. dell'Ospedale S. Maria Nuova. Libro Ricordanze. Reg. E. No. 52. 1655-1669. cc. 22t, Jan. 15, 1656.

[9] *Ibid.*, Reg. F. No. 53, cc. 70r, Sept. 4, 1675.

and to enforce good behavior among them. Failure to visit his patients for three consecutive days without prior permission would result in automatic dismissal from the staff. He was forbidden to treat patients in the women's hospital or nuns in the convent without express permission of the superintendent.[10] The testimonials offered him at the time of his separation from hospital duties because of his advanced age included a solemn qualification as "Professor in Surgery" by Monsignor Michele Mariani, superintendent of the hospital. This took place on 4 November 1699 at which time his son Tommaso was nominated to replace him.[11]

It is interesting to inspect a list of Giorgio's surgical colleagues, their positions, and their yearly stipend[12]:

Michele Martellucci, Physician and Surgeon	48 scudi
Tommaso Puccini, Lecturer in Anatomy	36 scudi
Lorenzo Vernizzi, Doctor to the Stinche[13]	24 scudi
Marcantonio Colligiano, First Master Surgeon	62 scudi
Pacinangelo Querci, Second Master Surgeon	52 scudi
Giovani Battista Carli, Third Master Surgeon	24 scudi
(He also received 24 cubic meters of wheat)	
Francesco Maria Rossi, Master Surgeon for women	29 scudi
Antonio Santerelli, Master *dei Castrati*[14]	24 scudi
Girolamo Coramboni, Second Master *dei Castrati*	18 scudi

Since the monetary value of Giorgio's "provisione in grascia" was 25 scudi, it would appear that he was among the poorest paid of the master surgeons.

Giorgio Alghisi died at his home on 26 October 1702, leaving a last will and testament which revealed a less than fatherly regard and devotion for his eldest son, Tommaso, whom he had trained in his art and who had replaced him as Master Surgeon at the Santa Maria Nuova Hospital. The will requests, most surprisingly,

10 *Ibid.*, cc. 98, Dec. 3, 1677; also, cc. 212, April 24, 1684.

11 *Ibid.*, Libro G. 1690-1714. cc. 117, Nov. 4, 1699.

12 *Ibid.*, Reg. no. 589, Volume marked "S. Maria Nuova 28," cc. 34-36.

13 The *Stinche* was the ancient prison of Florence built in 1299 for the detention of prisoners of war. In Giorgio's time political prisoners and debtors were held here. It was a large square building surrounded by a high wall with a single low entrance over which was written "Oportet Misereri" (Have compassion). The list of prisoners included many of the most famous Italian names, among them Machiavelli.

14 The *Maestro dei Castrati* was the surgeon who emasculated young boys with good voices who could then continue singing soprano parts and feminine rôles in the churches and theaters at a time when women were not permitted to take part. Apparently the parents of these children profited by the procedure since an author of a later and more enlightened day wrote: "Eight beds were earmarked [at the Santa Maria Nuova Hospital] to receive the unhappy children, who through the most inhuman barbarity of their own parents were, for the filthy love of money, condemned to emasculation." (Passerini, Luigi. *Storia degli stabilimenti di beneficenza della citta di Firenze.* Firenze, Le Monnier, 1853.)

that he be buried in the Church of San Firenze near his home, rather than in the Badia Fiorentino among his ancestors. He bequeaths a complete bed to his faithful maid, Margherita. To his daughter, Sister Maria Giovanni of the Convent of San Michele in Prato, he curtly leaves ten scudi with no further comment. The will provides a dower of 350 scudi to each of his unmarried daughters with the privilege of food and lodging in his house until their "human or spiritual marriage." As for Tommaso, he is bequeathed a paltry 25 scudi to be forfeited unless he leaves the house immediately or if he contests the provisions of the will. In a cryptic manner the will explains this virtual disinheritance with the words: "for causes best known to the Testator and to Tommaso." The remainder of the estate including the house was left to the youngest son, Girolamo, under the guardianship of his mother. The last provision of the will forbids the remarriage of the widow under penalty of losing the guardianship of the youngest son.

It is worth noting that Giorgio's will was not devised in a moment of anger, unrectified by the intervention of an untimely death. It was drawn up with rather exquisite care on 22 March 1693, nine years before his death, with the assistance of the lawyer Ser Niccolo Berti in the presence of six witnesses. And none of the achievements, increasing renown, and multiplying honors of his eldest son in the traditional familial pursuit of surgery, influenced the old man to lift his pen and change a word of it.

In accordance with Giorgio's wishes, his body was placed on view and then buried without ostentation in the Church of San Firenze on 27 October 1702.

There then began a long-drawn-out and bitter litigation in the law courts of Tuscany in the attempt by Tommaso to set aside his father's will. One of the most interesting records concerns Tommaso's appeal to the court for a type of trial reserved for the indigent. And for this purpose Tommaso signed a certificate of indigence at a time when he was known to have enjoyed a lucrative practice. That his plea was honored indicates that he enjoyed the help and sympathy of men of power in the government of Florence. Nevertheless, the court ruled against Tommaso and named Girolamo *erede universale* of his father's estate.[15]

15 (a) Atti dei Conservatori di Legge del 1704, filza 1391.
(b) Arroti S. Giovanni, 1702, 68-141. No. di Corda 3370.
(c) Arroti S. Giovanni, 1701, no. 32.
(d) Arroti S. Giovanni, 1701, filza no. 594 and 596.
(e) Arch. Notarile Moderno, 2685/87, 1702-1704, cc. 40, 46.

II

The pattern of education followed by Tommaso was probably that of the well-to-do-middle class of his day. At about the age of seven the child entered the *Scuola di Grammatica* where arithmetic, elementary grammar, geography, and the history of the Church and State were taught. Then followed five years in the *Scuola di Retorica* where Latin, Italian, and elementary Greek were taught and where stress was laid on literary composition and speech. The *Scuola di Umanita* might then follow where the classic languages, literature, art, and culture were studied intensively for three years. The schools were completely under the domination of the Jesuits and their doctrine was stressed constantly. The flame of science that had blazed so fiercely in the previous generations, vigorously fanned by Vesalius, Copernicus, Kepler, and Galileo, was now being smothered by the authorities—but not completely. For some inquisitive minds had been ignited even in this decadent period, and they struggled as best they could to keep the flame alive and to pass on their enthusiasm for the search for truth to their disciples. Outstanding among these were Lorenzo Bellini, Francesco Redi, and Antonio Valisnieri, with each of whom Tommaso was to study and to have the closest of associations.

Tommaso undertook his studies in anatomy under the tutelage of Lorenzo Bellini, the brilliant anatomist who at the age of twenty had already described the renal ducts bearing his name and had been appointed professor of theoretical medicine and later of anatomy at the University of Pisa. After thirty years at Pisa, he was called to Florence as Physician to the Grand Duke. His high opinion of Alghisi is expressed in the preface to his book, *Opuscula aliquot de motu cordis, de motu bilis, de missione sanguinis.*[16] Here he praises Alghisi's genius in surgery, great knowledge of anatomy, and good judgment, as well as his compassion for the afflicted who come under his care.

Tommaso's clinical studies were taken at the Santa Maria Nuova Hospital under the guidance of his father. On 25 April 1692, at the age of twenty-three years, he successfully underwent examination by the Commission for Examination of Doctors, Surgeons and Apothecaries, and was unanimously approved as a "surgeon among surgeons" (*cerusica con tutta cerusia*). He then continued

16 Bellini, Lorenzo. *Opuscula aliquot de motu cordis, de motu bilis, de missione sanguinis.* Pistoia, 1695.

his training in surgery as the equivalent of the present-day house officer under the Doctor Surgeon Michele Martellucci and the anatomist Tommaso Puccini. But he was chiefly influenced during this period by the great Francesco Redi, leading physician, scientist, scholar, and poet of the period. Redi, who was closely associated with the hospital and the medical school during the period of Tommaso's training, was a fine and dedicated teacher and a constant stimulus to the scientific approach to medicine. His attitude is exemplified by this passage from his *Observations on Vipers*[17]: "Every day I become firmer in my intention to give no faith to anything in nature except what I see with my own eyes and have confirmed by repeated and reiterated experiment." Redi's home was a gathering place for students and a virtual graduate school of medicine, zoology, and fine arts. Under the aegis of such a man Tommaso's horizon could not help but be vastly widened.

During the next several years, Tommaso worked in the hospital "only for God's sake and without provision or payment." Even his appointment as professor of surgery in 1699 contained the provision that his duties should be carried out "gratis and without payment until otherwise decided, being for the time being satisfied with the practice of his art and the helping of the poor sick for God's sake."[18]

Tommaso married Margherita Lombardi in 1697. The marriage was probably a love match; certainly it was not "arranged" for financial reasons since she brought with her a dowry of only 50 scudi. She bore him six children in sixteen years of marriage, all of whom, except for the last-born, died in childhood.

Upon the death of Tommaso's father in 1702, the hospital conferred upon him the annual *provisione in grascia* of wheat, wine, and olive oil that had previously gone to Giorgio.[19] And in addition he was permitted to carry on a private practice which grew more and more successful. He was especially popular among the nobility and highly placed men of the Church, among whom were Pope Clement XI and some of his most cherished officers. In the first year of Clement's reign, Tommaso successfully treated him for painful ulcers of the leg which won for him this pontiff's undying gratitude.

17 Redi, Francesco. Quoted by Saul Jarcho, "Giuseppi Zambeccari," *Bull. Hist. Med.*, 1941, *11*, 147.

18 Arch. Ospedale di S. Maria Nuova. Reg. no. 56. Recordanze. Libro G. 1690-1714. Nov. 4, 1699. cc. 117.

19 *Ibid.*, cc. 148-149. Sept. 1702.

Fig. 1. Santa Maria Nuova Hospital. Contemporary drawing. Note *fratelli della misericordia* bearing wicker litter (lower right).

Fig. 2. Antonio Valisnieri.

Fig. 3. Lorenzo Bellini.

Fig. 4. Princess Violante Beatrice of Tuscany. Patroness of Alghisi.

LITOTOMIA
OVVERO
DEL CAVAR LA PIETRA
DEL DOTTORE
TOMMASO ALGHISI
ACCADEMICO FIORENTINO
MAESTRO E LETTORE DI CHIRURGIA
DELLO SPEDALE DI S. MARIA NUOVA
DI FIRENZE.

ALLA SANTITA' DI N.SIG.
CLEMENTE XI.
SOM. PONT.

IN FIRENZE M.DCC.VII.

Nella Stamper. di Giuſeppe Manni, all' Inſeg. di S.Gio. di Dio.
Con Licenza de' Superiori.

Fig. 5. Title-page of Alghisi's *Litotomia.*

AL LETTORE.

Fig. 6. Alghisi's Coat-of-Arms incorporated in decorative drawing above introductory words to the Reader.

Fig. 7. Pope Clement XI.

Fig. 8. Cosimo III, Grand Duke of Tuscany.

It was probably because of his rather elite practice that he was honored by appointment to the *Consiglio de Duecenti* (Council of Two Hundred) in 1705.[20] This was an advisory assembly of the Medici government for the discussion of matters of state in the presence of the Grand Duke, who then did very much as he pleased. He was also appointed a fellow of the Academy of Florence called the Crusca, composed of the leaders of all the professions and arts; and he was embraced by the then fashionable *Arcadians* by whom he was dubbed *Cleostrato Leuconio*.[21]

Alghisi's first and most important published work was the book *Litotomia Ovvero del Cavar la Pietra* (Lithotomy or Cutting for Stone.) His second published work was a long "Letter from Sig. Tommaso Alghisi to Sig. Antonio Valisnieri in which are discussed: (i) Worms discharged from the penis and concerning their nature. (ii) Regarding a new solution for injection into the blood vessels of cadavers to outline all their ramifications as well as their capillaries. (iii) Regarding the most ingenious bandaging used by the people of Egypt in embalming their cadavers deduced from old mummies." The letter was published in the *Giornale dei Letterate d'Italia* of 1713. Allusion is made to another work—an anatomy—but no copy remains. It may have been merely a syllabus sold to students of the medical school of Santa Maria Nuova.

III

Alghisi's *Litotomia* was published in Florence in 1707 and was reprinted in Venice in the following year. It is a beautifully bound and printed folio volume, with numerous illustrations and vignettes drawn by the author. The book makes fascinating reading and gives one a magnificent picture of the man, his period, and the methods of his time.

Most Holy Father [he writes in dedicating the book to Pope Clement XI], The great honor, although undeserved because of the weakness of my talents, of serving the Sacred Person of Your Holiness, when in the first years of your glorious Pontificate you suffered for so long with heroic and inexpressible steadfastness the very painful ulcers on your legs, gives me courage now to place humbly at your Holy Feet this my book, hoping that that same great clemency, which did not disdain the work of my hands em-

[20] Arch. Firenze. Consiglio de Duecenti. Tratte no. 90. 1693-1730. cc. 244. April 30, 1705.

[21] The Arcadian movement was an almost spontaneous cultural revolt against the stilted and highly stylized Spanish influence. It was a return to the simple, the pastoral, and the informal exemplified by the classical Greeks—hence the term Arcadian. The members were given names of Greek shepherds.

ployed in your care, will deign now to receive benignly beneath its lofty protection a labor of the same hands, spread upon these sheets. Everyone knows and admits that in the eminent mind of Your Holiness the noblest, rarest, holiest virtues which one may imagine have chosen in one person their lasting seat, virtues which in the past centuries the most celebrated Pontiffs were selected in rivalry to illustrate; wherefore all the Christian world venerates the deep studies and the incessant cares with which you watch over the universal good of your Church; and admires the unwearied solicitude of your mind, turned always to foresee and to promote the advantage of the people. For these reasons I flatter myself that the present little work ought to be pleasing to you, being directed solely to the common good. I do not wish to hold as a mystery the operation of cutting for stone, nor, by hiding the best ways which surgeons ought to use in similar cases, harm by any means the public good.[22] If ever these, my slight labors, may attain the end that I wish, which is to help poor suffering men, it will all have to be founded upon the kindest favors which Your Holiness has been pleased to confer amply upon me; which have aroused in my spirit a keen desire to repay them in some manner that may be granted to me from my limited strength. And begging from Your Holiness Your sacred and Apostolic benediction upon me and my house, I bow to kiss humbly your most Holy Feet.

From Florence, May 16, 1707
Of Your Holiness
The most humble, devoted, obliged, and obsequious servant,
Tommaso Alghisi

Such florid and grandiloquent speech may indeed have sprung from Tommaso's fervent soul. But from what one knows of the period, no less stentorian phrases could be expected. As Sforza writes[23]: "In the 17th century nothing in Italy's social life had remained traditionally Italian. Everything had come from Spain; the ceremonies of the courts and of the aristocracy, the exaggerated politeness. . .; the low bows at meetings in the streets, the hand-kissing, the salutations that terminated letters—where 'I kiss your hand' and even 'I kiss your feet' had replaced our former and simple *'stato sano'* (keep well), and where everyone declared himself in the last line after a large blank space *'umilissimo e devotissimo servo'* (your most humble and devoted servant)."

The preface to the book is addressed "To the Reader." With appropriate modesty he writes:

It is not necessary, oh courteous Reader, that I weary myself in informing you of how important and useful the material regarding which I am writing; because it is only too well known that lithotomy is one of the most difficult and dangerous operations that may be done on the human body, and concerning which any work will always be well worth the cost which

22 Many of the lithotomists kept their methods secret, among whom were the Callot family of France and Rau of Amsterdam.

23 Sforza, Count Carlo. *Contemporary Italy*. New York, E. P. Dutton, 1944, p. 22.

is of value in facilitating the understanding and practice of it. This is what I have intended, solely for the public benefit, in this my treatise; in which I have tried to explain, with the greatest clarity that my limited ability has permitted me, all that appertains to this great and necessary operation: how I may have succeeded in this thing, I shall allow those to judge who are skilled in this art and who have seen what has been written of it until now by other authors. I have judged it good to write in vulgar Tuscan, because our beautiful and graceful language is not less proper than any other to write in all styles and of all subjects, as appears clearly in the marvelous works of so many great writers who with so much glory have written in this language the principles and precepts of even the most sublime and difficult sciences; and all the more so, now that I have had the honor this year of being admitted to the famous Florentine Society, under the direction of the most learned Abbott Salvino Salvini. In order to make my work, such as it is, a little better understood, I have sketched with my own hand the figures, which are included in the work.

And here I must not be silent, for the studies and observations made in the very famous hospitals of the city of Florence and especially in the very great and celebrated one of Santa Maria Nuova, controlled with laudable and incomparable prudence and affection by Monsignor Michele Mariana, which furnished freely all the necessary conveniences not only for the care of the sick but also for the studies of medicine and surgery, under the most happy auspices of his Royal Highness, the most Serene Cosimo III, Grand Duke of Tuscany and my most kindly lord, have been of great aid in my being able to give this information to all students of surgery.

Accept then, oh Reader, this part of my small knowledge; and if you find much information within this little work which may be spread scattered in other authors', know that I have collected it here with the sole purpose of presenting to you the most complete and the most exact work possible to me. May you live happily.

It is interesting to pause for a moment and contemplate the figure of Cosimo III, "Most humane father of his subjects and my most kindly lord." Of him Lumachi writes, "he was a sullen bigot and hypocrite who reduced Tuscany to a great cloister and impoverished the people with taxes. He was hostile to the arts and letters. The dynasty of the Medici was degenerate and on the verge of extinguishment."[24] One must not be too critical of Tommaso's sycophancy. The precedent had been established long before him and even by the great Vesalius' dedicatory letter to Philip II.

IV

The following is an abstract of Alghisi's methods, for the most part in his own words.

A. *What must be done on the morning of operation and the manner of binding the patient to the table.* On the morning the surgeon proposes to operate for stone, he and his assistants proceed to the patient's home,

24 Lumachi, Francesco. *Florence.* Florence, Soc. Editrice Fiorentino, 1935, p. 14.

allowing ample time for the necessary preparations, and behaving quietly so that the patient is unaware of their presence.

The preparations completed, the surgeon enters the patient's room with a cheerful mien and encourages him to enter the operating room willingly to rid himself of his pain. He advises him not to be frightened when he sees the instruments and the operating table and the devices for binding him.

Upon being placed on the table he is bound very firmly in the lithotomy position by the assistants. The surgeon, during this lengthy procedure should not neglect addressing the patient repeatedly with cheerful and encouraging words.

When the patient is securely bound an assistant takes his place on either side and grasps a leg to insure immobility, a third assistant stands to the surgeon's right with the guarded knife while the fourth straddles the patient to immobilize his pelvis and to support the scrotum at the designated moment.

It is not appropriate that there be too many spectators at the operation since they inconvenience the operator, confuse the patient and misinterpret the occasional accidents which accompany the operation.

B. *Regarding the operation.* After drying the scrotum and perineum the lithotomist lubricates a large grooved silver catheter in rose-oil and passes it into the patient's bladder. The assistant astride the patient elevates the scrotum and holds the perineum taut. The operator manipulates the silver catheter so that it bulges into the perineum. He ascertains the position of the groove by palpation with the finger the same way one does when he wants to find a vein before letting blood. Then he places the point of the knife against the groove in the catheter and cuts directly down toward the anus and then upward and downward again to be sure that he has incised the urethra perfectly.

Then the conductor is introduced into the bladder guided by the groove in the catheter. With the conductor in place, the catheter is removed from the penis. A stone-grasping forceps of appropriate size is passed along the groove of the conductor and introduced into the bladder. The conductor is then removed. The forceps is then opened and closed in various directions to dilate its pathway. It is advanced in various directions until the stone is encountered. The jaws are then opened gradually until the stone is engaged securely. It should not be extracted by one sudden and violent move but with great caution, giving the forceps gentle half turns, to the right and to the left, up and down, after which, most slowly, one can extract it without great lacerations.

While performing these movements with the forceps, the lithotomist should stop from time to time, give respite to the patient, encourage him and assure him that the stone will soon be out. The same should be done by the patient's father-confessor, since he can do much to help him bear his pain with patience.

After extraction of the stone one examines it to note whether it is complete or whether portions are missing. To make sure that no other stone has been left in the bladder one should insert the stone scoop for small fragments. If large fragments or other stones are present one should reintroduce the stone forceps as often as is necessary. When the bladder is freed of stones, the patient should be quickly placed in a previously prepared bed where he should rest with his legs somewhat separated and a soft bandage should be placed over the wound. Here he should be covered and allowed to rest quietly for some time.

C. *Regarding precautions to be observed in performing the operation.* The incision is a safe one provided the point of the knife stays within the groove of the catheter and only the skin and urethra are severed. If, however, the hand in the act of cutting slips too far down, hemorrhoids and the anal sphincter can be injured. And if the hand slips too far upward, because the scrotum was not sufficiently retracted, the testicles and their ducts might be damaged, and in the case of a hernia, the structures that make up the latter. The incision should be made greater or smaller in accordance with the age and size of the patient and the size of the stone to be extracted. It should be stressed however, that it had better be made big than small.

D. *On the method of crushing the stone in the bladder.* When the stone is of such size that a severe injury seems possible in extracting it, it is then better to try to crush it. For this purpose the lithotomist will use an appropriately sized stone crushing forceps.

When the stone is being crushed the lithotomist recognizes it by the sensation that whatever resistance there had been between the jaws is now gone, and yet the handles remain more or less apart, according to the quantity of stone fragments lying between the jaws of the forceps; which is different from the condition when the stone has escaped: in which case the handles are completely approximated. There are stones of exceeding hardness requiring stone crushers with diamond teeth.

E. *How the stone is extracted in the female.* The procedure of cutting for stone in the female is simpler. She is bound to the table in the same manner as is used in men. The assistant who supports the scrotum in men now has the task of separating the labia so as to expose the urethral orifice. In place of passing the grooved catheter (as is done in men), the lithotomist gently passes the conductor into the bladder. Then he passes a stone forceps of appropriate size along the conductor into the bladder and the conductor is withdrawn. By separating the handles of the forceps the vesical neck and urethra are dilated by the jaws of the instrument. This is done gently in all directions. The stone is then grasped and extracted. There are some surgeons who dilate the bladder neck and urethra with the dilator. When adequately dilated the stone forceps is passed into the bladder between the jaws of the opened dilator, the latter is removed and the stone extracted. The use of dilators is sometimes harmful if not manipulated by an expert hand. For instance, by excessive dilation one runs the risk of damaging the tissues so that incontinence results. If the stone is too large to be extracted intact, one should attempt crushing it. But if it cannot be broken an incision can be made at the vesical neck. Only one must be careful that the incision does not go so deep that the sphincter or other part of the bladder is injured.

Here I should not like to omit to recount of an operation which I performed in Florence in 1700, on a woman of thirty years, Anna Maria Vinci by name, from the city of Pisa. I removed three great stones and, being aware of their size, I crushed them, making the operation somewhat laborious. Nevertheless, she recovered completely in less than a month, without any obvious damage. What, however, aroused the greatest amazement was the fact that she, who was not believed to be pregnant, underwent a thorough purgation and had no symptoms, neither during the operation nor the purge, which could have suggested that she was gravid. After she had completely recovered, she stayed in Florence for about a month and then returned to Pisa by boat. This gave rise to various attacks of vomiting

and repeated fainting spells. And on the very day she arrived in Pisa she gave untimely birth to a fetus of four months, to the astonishment of everybody who was told the entire facts.

F. *On different methods of stone extraction.* The methods of extracting stone are classified by the ancients as three in number and named: the small, the high, and the great apparatus.

By the small apparatus is meant that operation in which few instruments are needed. The patient is placed on the table with his hands bound to his heels. His legs are held fast by two helpers, while another assistant elevates the scrotum with one hand and compresses the abdomen with the other hand to cause descent of the stone. The lithotomist inserts two fingers in the rectum as far as possible beyond the stone and attempts to compress the stone toward the perineum. And when the stone descends to the extent that a bulge is apparent in the perineum, the lithotomist makes an incision over the stone. Without releasing the grip he has on the stone rectally, he attempts to extract the stone through the incision with a stone forceps. In this operation both the intestines and the bladder can suffer considerable injury by the forceful compression as well as by the unguided incision. And for these reasons this method, though described in the literature, ought not to be used in practice.

The second operation is made in the hypogastrium. It is named for its inventor, Pietro Franco. With the patient lying on his back and held fast by two assistants, the lithotomist inserts two fingers of his left hand into the anus and pushes the stone upward toward the hypogastrium. At the same time an assistant compresses the abdomen from the right groin so that the stone is pushed to the left groin. There the lithotomist makes a cautious incision over the prominence produced by the stone. Through it he passes a probe with which he immobilizes the stone. He then passes a stone forceps along the probe into the bladder and down to the stone, removes the probe and grasps the stone with the forceps. Although this operation has been described by Pietro Franco, he does not advise using it routinely, but only when the stone is too large to be extracted perineally. And the stone must be palpable through the abdominal wall after being pushed upward by the fingers in the anus. I personally would strongly assert that this operation should not be performed, notwithstanding Franco's success in its use in a child of two years. One should not cite such a singular case as an example because it is not easy to mobilize the stone by rectal manipulation and then make an incision through the muscles, peritoneum and bladder without damage to the intestines. Furthermore wounds in the fundus of the bladder are in the majority fatal, although there is no lack of reports by men who claim to have succeeded in healing wounds even in this region. But these are instances to be told as miracles, because experience is to the contrary.

The most appropriate method and the best among them is to make the incision in the perineum under the guidance of the grooved catheter. And this is the procedure which the ancients called the great apparatus. However, it is by no means without dangers, especially when performed with an inexperienced hand and with disregard for the exacting technique and proper after-care. And sometimes the latter turns out to be more difficult than the operation itself due to the complications which may suddenly occur.

This is truly one of the greatest, even the most remarkable, of all surgical operations requiring the highest study and accuracy to perform it well. For

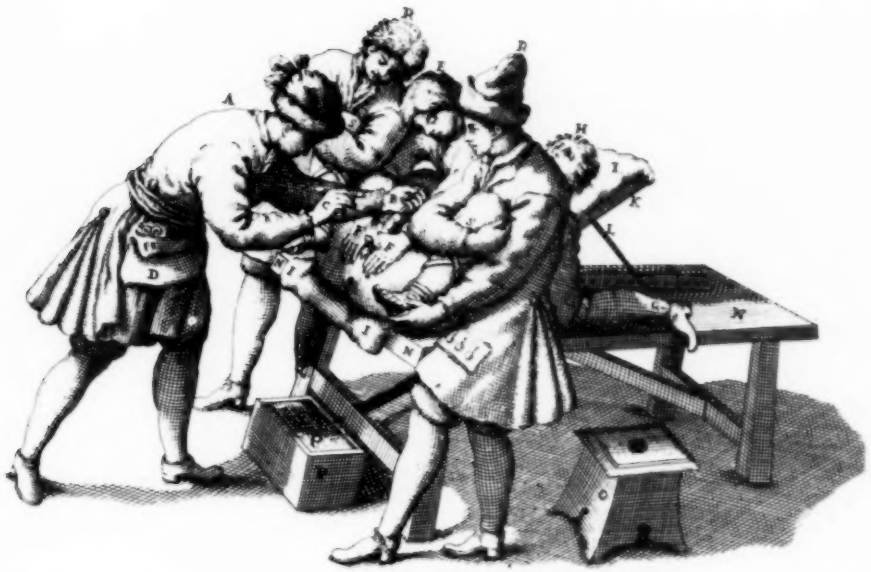

Fig. 9. The patient bound and restrained; the scrotum retracted and the perineum held taut; the grooved catheter bulging the perineum; and the lithotomist poised for the incision.

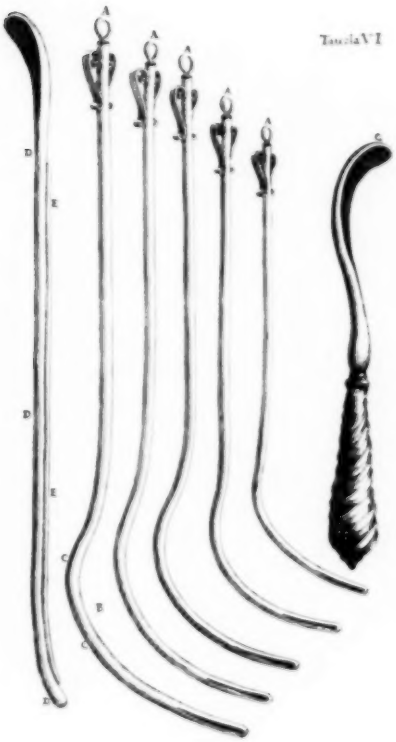

Fig. 10. The probe (*bottone*). Graded sizes of grooved catheters. Stone scoop.

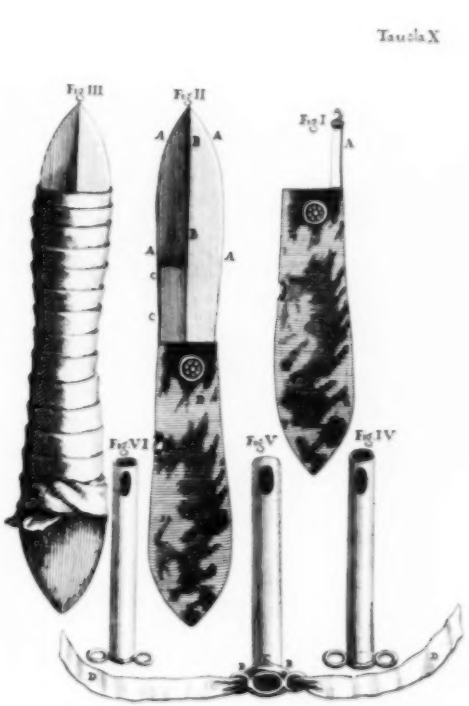

Fig. 11. The knife (I, II, III). The retention catheter (*cannula*) for post-operative continuous bladder drainage (IV, V, VI).

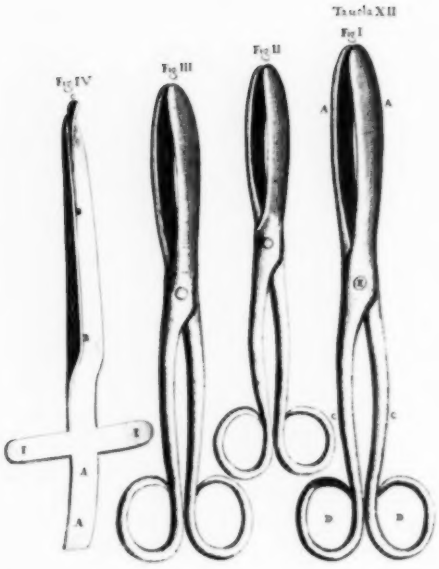

Fig. 12. The conductor (IV). Graded stone forceps (I, II, III).

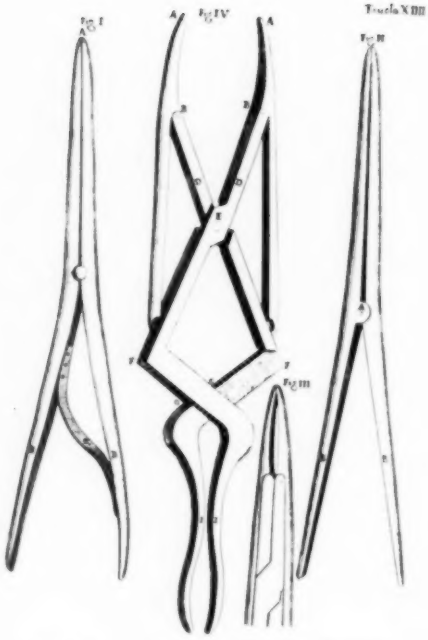

Fig. 13. Vesical neck dilators.

Fig. 14. Stone-crushing forceps.

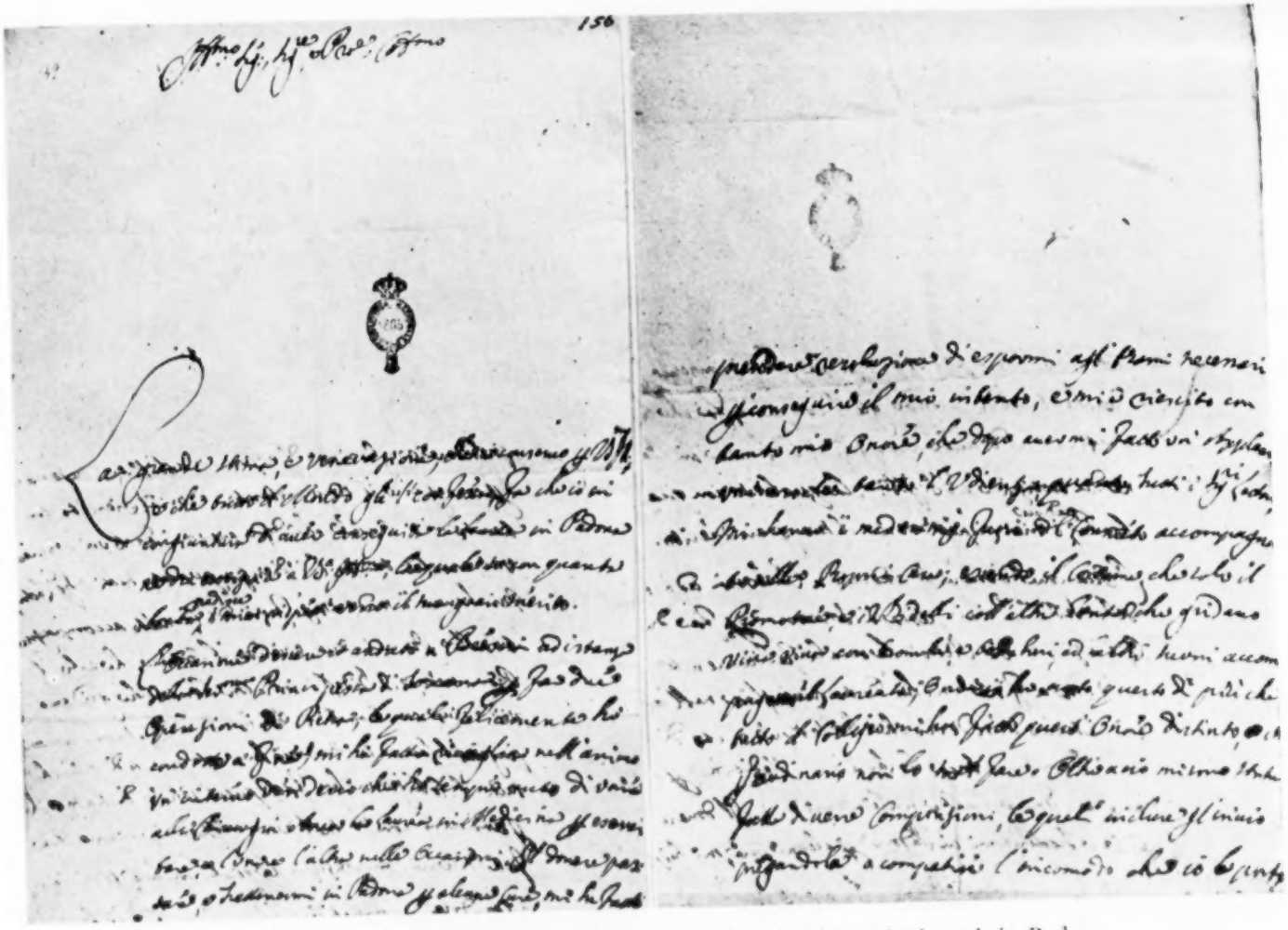

Fig. 15. Letter from Alghisi to Megliabechi informing him of triumph in Padua.

Fig. 16. Antonio Megliabechi. Note tattered, soiled linen and unkempt wig.

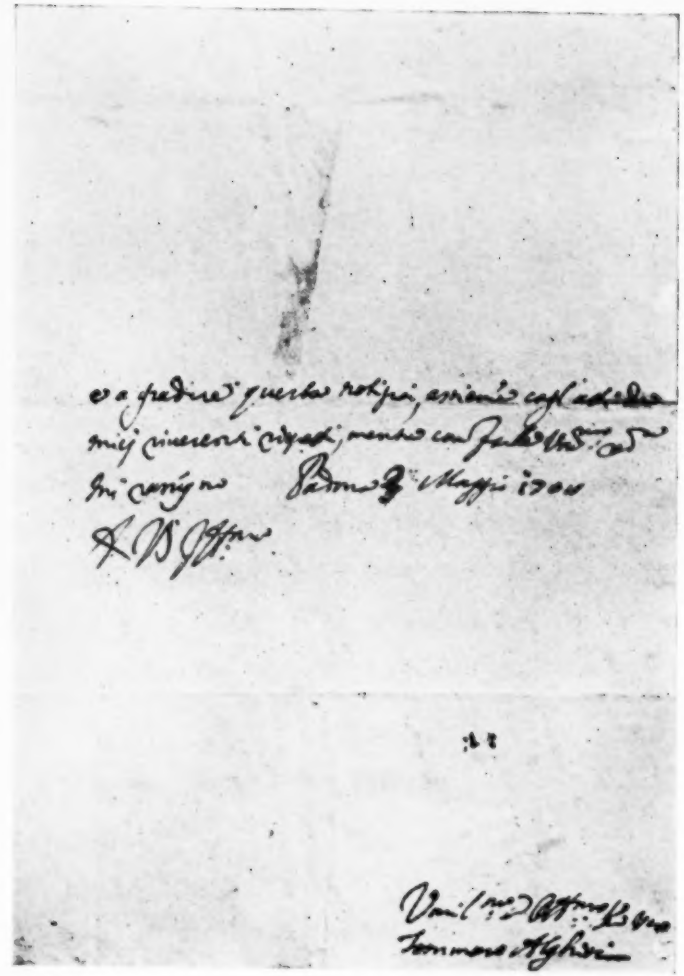

Fig. 15 (Cont'd). End of letter to Megliabechi.

Fig. 15 (Cont'd). End of letter to Megliabechi.

this reason, the patients or their relatives should reward the surgeons copiously, demonstrating the kind of gratitude which their efforts deserve. And they should not be surprised when the surgeon seeks to set the fee prior to operation. For it is not unusual for patients to make, quoting the words of the greatest Tuscan poet, "great promises and meager fulfillments." And after recovering their health and no longer suffering the agonizing pain caused by the stone, they quickly forget their obligations. All this refers only to those who, though capable of recompensing the surgeon, fail to do so. For I well know that the poor no less than the rich require all necessary help, and the physician should not be influenced exclusively by his fees. Charity should have the greater influence. For by the payments he receives from the well-to-do he earns security in this life only, while by his charity to the poor he assures himself greater and more precious wealth in the other world.

G. *On the general treatment after operation.* After the lithotomist has brought his operation to a perfect end, he should leave the patient undisturbed in his bed for quite a while. This allows blood to effuse from the wound aiding in avoiding inflammation. Barley-water and heated rose-oil is then prepared and brought to the bedside. The windows are closed and a candle is lighted. The lithotomist then sits at the right side of the bed and the assistant stands on the left. Removing the patient's covers, the lithotomist lifts the scrotum and removes the blood-drenched cloth which he had previously placed on the wound and carefully wipes away the blood clots around and in the wound. Then he lubricates the silver cannula with rose-oil and introduces it into the bladder through the wound. This could very well be done immediately after the operation when the parts are more widely open and the instrument can pass more easily. When the cannula is in good position, he syringes the penile urethra and the bladder through the cannula with barley water in order to clean the penis and bladder. And in case the cannula is plugged by blood clot or mucus mixed with stone fragments, he can remove the material with a fine pen or a probe wrapped in cotton.

The wound is then dried gently and the elaborate bandages arranged so that they can be quickly applied after the toilet and medication of the wound. The wound is painted with rose-oil using a bundle of feathers as a brush. This contributes considerably to the alleviation of pain. Then rose ointment is applied and covered with lint whereupon the bandages are brought into place in order that the dressings and silver cannula be held securely, yet leaving the anal orifice free. The patient's sheets and dressings must be kept dry lest bed sores develop.

The patient must be treated as a severely wounded person. One must give first consideration to the need for blood letting, regardless of how much blood letting he has had before, in order to avoid inflammation with greater certainty. One can let blood more freely in the strong patient and in those who have lost little blood during the operation. I am of the opinion that it is helpful to bleed the patient not only once but perhaps repeatedly, from the arm as well as the foot.

The food during the first few days should be very restricted and simple, such as broths and soup and the bowels should be moved by simple enemas when the patient fails to have regular evacuations.

Treatments (irrigations of the bladder and application of medication to the wound) should be given three or four times daily for the first few days. The wound should be uncovered as little as possible, since the air

is most harmful to wounds, especially the cold air. After two or three days the silver cannula can be removed. The wound is then examined and a packing of appropriate size is introduced, moistened with a compound digestant, which is composed of equal parts of sweet basil, Venetian turpentine and egg-yolk. Instead of this, one can use Balsam of Arceo or another digestant composed of turpentine, hypericum oil and egg-yolk—one is as good as the other—to insure an uneventful recovery from the operation.

The Balsam of Arceo is compounded as follows:

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Gum Elemi cut in small pieces and clear Venetian turpentine, of each sufficient to make 1½ ounces. Melt the gum on slow fire, then add turpentine and 2 ounces of he-goat's tallow (or lacking this: tallow of a gelding) and 1 ounce rancid and unsalted pork-lard. After these are liquified and mixed, heat, pass through strainers and transfer to containers ready for use.

The packing should be bound at its distal end and for greater safety two threads should be attached to it so that it can be pulled out in the event that it enters the bladder.[25] Over the packing one applies lint with rose ointment and the usual dressings. This treatment is repeated twice daily, because this repeated medication and irrigation prevents the fermentation of the pus. The lavage with rose-oil and the dressings with salve for the scrotum and pubic region are to be continued until the seventh day, provided no complications develop.

As the wound becomes clean and begins closing, the packing is to be made proportionately smaller, making sure that healing does not take place superficially before its depths have done so. And when healing has progressed to an adequate degree the packing and irrigations should be discontinued and only a dressing dipped in balsam should be applied to the wound. When, during this period, the patient wishes to urinate, he should apply gentle pressure to the dressing so that the urine is diverted through the urethral orifice. Much is contributed to the strength of the wound by the elevation of the scrotum, the adduction of the legs, and the proper arrangement of the dressings.

Some men close the wound completely after stone extraction because of the danger of fistula. This concept is erroneous since the wound must be kept open, not only to rid the bladder and surrounding tissues of bloody extravasate which, if retained, would putrefy but also because of the inevitable injury to the wound in the process of stone extraction and these areas must of necessity putrefy. Therefore, it is necessary to introduce medicated packing to digest and purify the putrefied area. Fistula need not be feared as long as the putrid parts are entirely removed and if the packings are properly diminished as healing progresses.

The patients of good constitution who have had good care sometimes recover within twenty-five to thirty days, but sometimes the incision is slow to cicatrize. I extracted three great stones from Signor Allesandro Frauto, aged fifty-one, who was perfectly cured in twenty-one days. Similarly, I extracted a very big stone from a man from Siena (referred to me by the

[25] Note similarity to Ambroise Paré's treatment of chest wounds: ". . . I put in each wound a tent (packing) . . . attached by a thread for fear that by inspiration they should be drawn into the cavity of the thorax. . . . The tents were annointed with yellow of eggs and turpentine, with a little oil of roses." (From George and Beate C. Rosen: *400 Years of a Doctor's Life*. Henry Schuman, New York, 1947.)

illustrious Signor Marquis Cammillo Vitelli), who was cured in eighteen days. The usual duration of cure is between thirty and forty days provided, however, that the body is of good temperament and that no complications are met with.

Women are treated in the same manner as men. And frequently, unless there are great lacerations, there is no need for packing or other medication, the mere ablutions by the urine being adequate for cure. A few weeks ago I extracted two stones from Signora Caterina Radi, aged seventy-two, who though in debilitated condition due to her agonizing pains, was cured in a short time and with no defect remaining.

H. *Special treatment after lithotomy. Treatment of complications.* Complications after operation are: pain, hemorrhage, syncope, tympanites, fever, inflammation, anuria, swelling or abscess of the scrotum and its surroundings, suppuration of the wound, excoriation caused by the urine, diarrhea, insomnia, delirium, vomiting, singultus, etc.

The pain can be considerably mitigated by anointing with soothing oils, douches and fomentations. And this relief of pain should be our first aim except for the arrest of hemorrhage which takes precedence. For blood is life's treasure. Arrest of bleeding is accomplished by the application of styptic powders and other related remedies. But if it arises from lacerated vessels around the bladder neck, the treatment will be difficult because the flow of urine diminishes the effectiveness of the drugs. Neither pressure dressings nor the use of ligatures, sutures, or the actual cautery are suitable here as they are in external parts. And though generally no important vessels are found around the vesical neck, one must operate with care since occasionally lacerations here produce a great loss of blood and subsequently death.

Syncope is the result of exhalation of the spirits which escape with the blood during a prolonged and painful operation. The remedies used are the quintessences applied to the nares and the cordials which are taken by mouth.

Painful distention of the abdomen is prevented by oily douches and by emollient fomentations which are applied hot to the patient's abdomen.

Fever is treated by diet and liquid and soothing food, capable of restraining the hot movement of the humors. If inflammation of the bladder is suspected, blood letting from the foot and arm are very much in order. Enemas and calming fomentations over the hypogastrium are common procedures in painful distention. This complication is usually associated with inflammation and sometimes with anuria, though this rarely occurs.

Swellings of the scrotum or near it are treated in the beginning by the application of resolvent remedies or fomentations or plasters. If an abscess develops, which in the majority of cases develops in the scrotum, it is often best drained through the wound. If, however, no pus is obtained by probing through the wound and fluctuation is present, incision is made over its most prominent part. These swellings arising after operation sometimes give more trouble to the professor than does the incision itself. This was the case with me, some years ago, in a young man referred by the illustrious and famous Senator and Marquis Pier Capponi, Chamberlain to the most serene Princess of Tuscany. This patient, some days after I had extracted a big stone from him in the Hospital of S. Benifazio of Florence, developed a large abscess of the scrotum and pubic area necessitating various incisions. He was cured earlier from the operation for stone than from this complication which was indeed troublesome in healing.

Suppuration and other affections of the wound are treated according to the general principles of surgery, except that drugs of excessive detergent action and irritants should not be used; the urine itself and the welcome ablutions are adequate.

Excoriations caused by urine between the nates and around the scrotum are treated with dressings of rose pomade, rose ointment or white ointment. Dressings should be changed often and the patient kept dry. If annoying, the dressings can be omitted and medications can be applied directly to the skin.

Diarrhea is checked by soothing enemas and by preparations of coral, mother-of-pearl or of hartshorn. If the abdominal pain is due to worms various vermifuges can be used. Years ago I extracted three big stones from a young country boy in the Hospital of S. Matteo in Florence; on the eighteenth day after the operation, when the incision, by good fortune, was about to close, he suddenly developed excruciating pains around his umbilicus. After many enemas worms were observed being evacuated and considering these as the cause of his pain, I had him take aqua di Gramigna which had been boiled with mercury. During the next eight days he discharged an enormous quantity of worms and his pains ceased. Within a short time he was completely cured.

Insomnia with delirium, vomiting and singultus following operation, if persistent, are signs of bladder inflammation and damage, and as such, harbingers of death. For this reason, all treatment usually fails. One ought not, however, to abandon the patient on this account, but ought rather call upon a physician for assistance without whose advice the prudent lithotomist would not undertake any course of action.

I. *Disorders after operation especially the fistulae and their cure.* At times the final result of operation is less than perfect despite its execution according to the precepts of the art. Instead of ending in perfect healing a new stone may form; or a perineal fistula may persist; urinary or fecal incontinence may result; or other disorders develop, each with its own cause, differential signs, prognosis, and treatment.

In a patient whose kidneys are disposed to provide the bladder with calculi and substances capable of generating calculi, new bladder stones will rapidly form around the nidus supplied by the kidneys despite the rapid healing of the incision. In such cases one must not immediately operate again, but should postpone surgery until the patient has regained his strength.

Perineal fistula results from allowing the surface of the incision to close before its depths have filled in; or by too prolonged use of packing which was not diminished in size as the wound became smaller; or as a result of the patient's general debility, his adducted legs or his excessive diet producing extraordinary and lingering suppuration which in turn leads to a loss of substance in his urethra. The latter is then unable to close perfectly. Excessive corrosive power of the urine or excessive emaciation can be factors.

These perineal fistulae may be straight or tortuous, deep or superficial, single or multiple; some end near the raphe while others may end in the rectum. The straight and not-too-old fistula in a patient of good constitution, though difficult, do occasionally lend themselves to cure. It is treated by dilating them in order to expose the entire tract and then applying a caustic to eliminate the induration entirely. The milder caustics are preferable. We do not approve of the actual cautery. After the induration is removed, the wound is strengthened by certain balsams, among them, the

balsam of Peru; the balsam of Pope Innocent XI; and the balsam manufactured in the foundry of the most illustrious Prince of Tuscany.

When the fistulae are tortuous or multiple it is necessary to convert them to a straight and single one. Those ending in the rectum are less annoying but incurable.

Incontinence of urine may result from injury to the vesical sphincter. When it is only weakened, time and corroborative remedies may help its return to normal. When the muscle fibers are considerably torn, the injury is completely incurable.

Incontinence of feces due to injury to the anal sphincter is cause for deep dejection, as there is no remedy. It is caused by carrying the incision too far downward or by suppuration of the muscle fibers.

Women, though not subject to fistula, are more prone to develop incontinence than men due to the structure of their urethra. Their incontinence is concealed by the use of pads and sponges. To men with this difficulty it is helpful to use a small bottle bound to the hips to catch the urine, or other devices which are indeed effective in helping to retain urine but are so inconvenient and difficult to manage continuously that I omit a more detailed description of them.

While this treatise was in press I removed two stones, one in Pescia from Signor Giuseppe Rossi, and the other in Pistoia from Giuseppe Andreini, Carnaccino by surname. In the latter case there was great difficulty in establishing the diagnosis of stone, since he had been thought to be suffering from another disease. By great diligence I succeeded in sounding the stone and then extracted it successfully. Therefore I thought it appropriate to append this short report in order to emphasize to the novice in lithotomy—for whose instruction I have undertaken this labor—how great their efforts in sounding ought to be, so that they can state for certain whether or not there is a stone in the bladder.

V

Tommaso's second published work—his letter to Valisnieri[26]—is most interesting in its first chapter entitled "Worms discharged from the penis and concerning their nature." It was a contribution of an astute observation to help settle the controversy regarding spontaneous generation which was raging at that time. Valisnieri was one of the foremost opponents of spontaneous generation, proving experimentally time after time that each organism must arise from its own seed (omne vivum ex ovo).

Tommaso writes that just at the time that he was most convinced about the validity of Valisnieri's concept that all worms found in the human body were offspring of similar worms, he was presented with the case of a child of seven years who had passed sixteen worms through his penis within the past year. These worms were of the genus ascaris, were often of the thickness of a quill and as long as half an arm in length. The child also evacuated an in-

26 Giornale dei Letterati d'Italia, Vol. VI, Art. 3, p. 149.

numerable number of these worms in his stools. Despite the *belief* by others that the worms which issued from the penis were spontaneously generated in the bladder and kidneys of the child, Tommaso decided that *observation* and *investigation* would be more fruitful than *conjecture* or *debate*. He passed a rectal speculum and saw a fistulous opening between the rectum and bladder. He confirmed the presence of fistula by passing dye from the rectum into the bladder and by observing urine pass through the tract. After making these observations he abandoned the belief that these worms were spontaneously generated in the kidneys or bladder and decided that they passed from the rectum into the bladder through the fistula.

"This event, it seems to me," Alghisi concludes, "confirms plainly what Your Highness has so wisely stressed, namely, how necessary it is to beware of easy judgment, giving credence to other people's tales or allowing oneself to be guided by common opinions without thinking it over and making precise observation in order to discover the truth of the matter."

VI

In 1708 Alghisi appeared before the faculty of the School of Medicine of the University of Padua for the purpose of obtaining the degree of Doctor of Medicine. He was sponsored in his examination by Antonio Valisnieri who was professor of theoretical medicine at the school. The account of his experience before this august body is preserved in a letter written by Alghisi to Antonio Megliabechi, librarian to the Grand Duke, on the very evening after the examination.[27] This previously unpublished letter was found among the correspondence of the librarian housed in the magnificent National Library of Florence bearing his name. The letter, dated 3 May 1708, begins with the traditional flourish:

> Very illustrious Sir and Most Worshipful master: The great esteem and veneration in which I hold you, not exceeded by my feelings toward anyone else, is the reason why, having obtained the Doctorate in Padua, I now inform you of it, knowing how kindly you accept my feelings toward your high merits.
>
> Since I had to go to Brescia at the request of the Princess of Tuscany in order to perform two operations for stone which fortunately turned out well, its nearness to Padua aroused in my heart the old desire to add to my doctorate in Surgery the one in Medicine, that they might augment each other in the course of my practice.

27 Biblioteca Nazionale Centrale di Firenze, Sezione Manoscritti Codice Megliabechiano, No. 88. Classe VIII, Carte 156-157.

Inasmuch as I had to pass through Padua and stop there to administer to some patients, I decided to face the necessary examinations to achieve my goal; and I was so successful that after being enthusiastically applauded by the public and the examiners, they all escorted me to my house, contrary to all custom, since generally only the sponsor and some beadles together with a few other people shouting 'Viva, Viva', and blowing trumpets and beating drums and other instruments, accompany the Laureate. But in my case the entire college participated in granting me this distinctive honor.

And in addition, several compositions were written in my honor which I enclose.

Begging you to pardon my troubling you and to accept this news together with my respectful regards while I remain your most humble and obedient servant, Tommaso Alghisi.

One might guess that it was more than high esteem that prompted this hasty letter to Megliabechi. He was a well-known gossip and informer who delighted in spreading news, true or false, and Alghisi could have chosen no faster route for disseminating the news of his triumph. Megliabechi was a prodigious reader who forgot nothing that he had once read but he had little critical judgment. He was a rather odious character, personally, and even his portraits portray his toothless, sardonic smile, unkempt hair, and soiled and tattered linen. Unbathed and odorous he collected books with miserly compulsion, bequeathing them upon his death to the Library of Florence, now known as the Biblioteca Megliabechiana.[28]

No record of the "several compositions" written in Alghisi's honor can be found.[29] It was the custom during that period for friends, colleagues, and admirers to honor achievement by writing odes or sonnets of praise. Count Carlo Sforza writes: "When my great-great-grandfather presented his doctorate thesis at Parma on the propositions of Galileo (science was then in fashion), a collection of fifty sonnets was published praising the genius of the young student who never did another thing in his life."[30] In the preface of Gioacchino Parisi's *Litotomia* one may glimpse at the sonnets written in honor of another lithotomist of the period who was not too modest to include them in his published work.[31] A translation of one of them is here presented to illustrate the sort of composition probably written in Alghisi's honor and to which he refers in his letter to Megliabechi.

[28] Collison-Morley, Lacy. *Italy after the Renaissance. Decadence and display in the 17th century.* New York, Henry Holt and Co. (c. 1931).

[29] The records of the University of Padua concerning individuals upon whom the Doctorate was conferred from 1700-1708 have been lost.

[30] *Op. cit.*

[31] Parisi, Gioacchino. *Appendice al taglio della litotomia sopra la cura dell'iscuria legitima o vesicale.* Palermo, 1752 p. 18.

In Praise of the Author

Parisi, thou hast reached the peaks!
For in conquering Nature's mysteries,
No man, be he even Hermes himself,
Can even approach thy lofty plane.
Nor before thee was there e'er another
To wield his knife within the secret flesh.
Though thou cut him deeply, his ills mend
And he thenceforth lives in peaceful health.
How well thou didst relieve that wretched man
Who by mortal strangury was seized——
Submerged in Death's black stream——
thou snatched him back
By cutting down the dike to his contrary fountain.
The dam dispelled, his fountain freely flowed——
This feat accomplished by thy boundless skill.

Apparently Alghisi's success in obtaining the Doctorate in Medicine was not hailed with as much enthusiasm at his home hospital as at Padua, since his request for permission to combine medical practice with his surgical activities was not even considered until 1710, when it was summarily denied. Then in May 1713, his request was finally granted but with restrictions.[32] Staff privileges were as jealously guarded then as they are now!

VII

A short account of the Hospital of Santa Maria Nuova appears pertinent at this point. It was founded in 1288 by Folco Portinari, father of the Beatrice immortalized by Dante, for the purpose of taking care of the indigent sick of Florence. It is the oldest and most celebrated of the Tuscan hospitals. In a manuscript dated 1479 mention is made that the hospital had an average daily census of six hundred patients. This figure appears unusually high but may be accounted for by the presence of the plague in Florence at that time. Cosimo I placed the hospitals of Pistoia, Pisa, and Leghorn under the control of the superintendent of the Santa Maria Nuova Hospital and this combined administration persisted during Alghisi's time. Cosimo III established the Capuchin Order within the hospital for the spiritual guidance of the sick. He also established a division of the hospital (Pazzeria) for the care of the insane. The hospital had about five hundred beds in Tommaso's time, with about equal numbers of men and women.

32 Arch. dell'Ospedale S. Maria Nuova. Ricordanze. Libro G. cc. 264-265, May 15, 1713.

From the inception of the schools of medicine, surgery, and pharmacy at the Santa Maria Nuova Hospital in 1654 indigent students were accepted and granted an extremely meager subsistence with the agreement that they were to serve the hospital for seven years. During this period they received only their room, food, and a gown of dark cloth every two years. These indigent students numbered about seventy each year.

During Tommaso's time there was an average of seven hundred deaths per year in this hospital with an average daily census of five hundred patients.

Through the centuries the hospital acquired the works of art of many of the masters, including Ghirlandaio, Andrea del Sarto, Ghiberti, Verrocchio, Botticelli, Bronzino, Fra Giovanni Angelico, Volteranno, and Luca della Robbia.

The employees in 1700 numbered about 315 and are listed as follows in the hospital archives:[33]

Superintendent	1
Assistants to Superintendent	7
Sextons and Chaplains	10
Clerks	6
Capuchin priests and one lay brother	7
Nuns in the convent	125
Medical Assistants (House Officers)	6
Students	73
Orderlies and waiters	11
Servants of the Superintendent and his aides	4
Laborers	10
Farmers and dining hall attendants	3
Porters	8
Cooks and Bakers	8
Sweepers, Anointers and Gravediggers	8
Gardeners	2
Mule-drivers	9
Other craftsmen	20

An account of the inventory of the medicinals in the hospital pharmacy on 30 June 1707 includes the following items: Various healing waters, pills, infusions, plasters, syrups, pink vinegar, honey, various oils, preserves, juleps, ointments, sugar, drugs, gums, and salt. There were also candles, flax, leather, rope, copper, lead, tin, wool, and cotton. There was a large store of "chemical medicaments" which were not itemized.[33]

A most interesting organization was the *Compagnia della*

33 Arch. irenze. Deposito dell'Arcispedale de S. Maria Nuova. Reg. no. 592. "Stato dello Spedale per l'anno 1707."

Misericordia (Company of Mercy), organized in 1325 by Pietro di Luca Borsi. Hearing the name of the Lord constantly blasphemed by his fellow workers he suggested that each time they committed this sin they be fined a small sum. A large sum of money was thus accumulated in an incredibly short time which was used to purchase six wicker litters, one for each section of the city, to carry the sick to the hospital and the dead to the cemeteries. This benevolent duty was performed by the same group who purchased the litters, and they became known as the *"Fratelli della misericordia"* (Brothers of Mercy). The group contained members from all strata of society. Because of its fine work it was the beneficiary of huge endowments. In 1425 its swollen treasury fell under the eye of Cosimo the Elder, who convinced the Signoria that the organization would function more efficiently as a creature of the State. It so decreed and confiscated the organization's assets. As is so often the case in such circumstances, the membership lost its zeal in performing its errands of mercy. The climax was reached on 13 January 1475 when a poor old man died and no one came to remove his body to the cemetery for several days. Finally, a certain Antonio took up the corpse on his shoulder and, followed by a large crowd, carried the body to the Palazzo Vecchio, where he deposited it at the feet of the Minister of Justice. The government, sensing the anger of the people, hastily restored the organization's independence and it exists to the present day as a voluntary institution.[24]

VIII

On 21 July 1713, while hunting quail, Alghisi met with the unfortunate accident that was to result in his untimely death.

From time immemorial decoy birds had been used by the Mediterranean people to lure quail into cleverly concealed nets or into the sights of their guns. The preparation of the decoy birds is touchingly described by Axel Munthe in his *Story of San Michele.*[34] "Hidden under the thickets . . . are caged decoy birds who repeat incessantly, automatically their monotonous call. They cannot stop, they go on calling out night and day until they die. Long before science knew anything about the localization of the various nerve centers in the human brain, the devil had revealed to his disciple Man his ghastly discovery that by stinging out the eyes of a bird with a red-hot needle the bird would sing automatically."

34 Munthe, Axel. *The story of San Michele.* New York, E. P. Dutton and Co., 1930.

One such bird of Alghisi's escaped from its cage on this unhappy day and in its aimless frantic fluttering, could not be recaptured. Whether in anger or in pity, Alghisi charged his gun and shot at the bird—but the gun misfired. He increased the charge and pulled the trigger but it misfired again. Then he tripled the charge and when he fired, the barrel exploded and carried away most of his right hand.[35]

He was brought back to his home extremely depressed because the accident brought to an end his surgical career. The hand became badly infected and he had to submit to an amputation at the wrist, but in his depressed mood he failed the follow the directions of his physicians. Upon hearing of the unfortunate accident Pope Clement directed the Grand Duke to visit Alghisi. Despite the offer of the chair of surgery at the University of Pisa and a generous pension, Alghisi failed to rally and died three months after the accident on 24 September 1713 at the age of forty-three years. His body was placed on view the next day in the Badia Fiorentino where he was buried among his ancestors.

In the very month of Alghisi's death there appeared an unsigned article in the famous *Giornale dei Letterate d'Italia*[36] lamenting the death of Alghisi and relating the concern of the Pope and the generosity of the Grand Duke. The article then continues quite cheerfully:

> On this occasion we consider it appropriate to call attention to a Lithotomist from Macedonia who is now living in Venice and who understands neither the Italian language nor the Latin, but who is able to extract stones with astonishing ease without any preparation and without the use of such terrible instruments until now used by everyone, but merely with the use of a razor and a small iron hook. He fastens the arms of the patient to a wooden cross with ropes which are then carried downward to elevate and abduct the legs. He then introduces two fingers into the anus and quite easily maneuvers the stone downward and outward, cuts down upon the projection made by the stone in a corner of the perineum and takes the stone out through the wound with the hook, all this without causing any pain to the patient. He then applies egg-white to the wound and on the following days he sprinkles it with flour and

[35] It is interesting to note the inconsistencies in the various accounts of the injury by contemporary writers. The Canon Falco Portinari (Libro di Ricordi: 1700-1720, Biblioteca Marucelliana, Manoscritto c. XXVIII, cc. 94-95) writes: "Yesterday afternoon at 6:30 Alghisi, after having lost his *right hand* . . . passed on to a better life." The Diario Fiorentino (Vol. XV, 1713-1723, Sept. 24, 1713) tells of Alghisi's death following the loss of his *left hand*. The Poligrafo Gargani (Biblioteca Nazionale Centrale di Firenze, Sala Manoscritti, Pacco 44) describes the injury as the loss of his *right arm*. A right-handed person would have been expected to hold the barrel of his gun with his left hand. But this knowledge is of no help in Alghisi's case since he was ambidextrous.

[36] Giornale dei Letterate d'Italia, Vol. XVIII, 436, July-September, 1713.

other simple remedies and leaves to nature the duty of healing and cicatrising it. And in many cases this has happily occurred. Such a simple and easy technique has stupified the professors of the Art as it would have stupified Hippocrates himself, who considered cutting for stone so difficult that his oath forbade its performance by the practitioners.

And then, as though determined to be fair about the matter, the article refers back to the already all-but-forgotten idol of yesterday:

We read in the last book of Dr. Valisnieri that the above mentioned, well-remembered, late Dr. Alghisi was about to publish a new method for the extraction of stone, devised by him, quite different from any method used until then, free from danger and safer from the complication of fistula. Valisnieri assures us that this new method was used by its innovator last Spring in the Hospital of Florence upon a boy named Agostino Vezzosi, son of Alessandro from the district of S. Miniati al Tedesco, and that this patient was referred to Alghisi by the Princess of Tuscany and that although the patient was very ill, the operation and treatment were eminently successful.

Unfortunately no record is left regarding the nature of Alghisi's new operation.

An appraisal of his recorded method reveals it to be essentially the *grand appareil* of Giovanni di Romanis and Marianus Sanctus of two centuries earlier. His contribution was a refinement and polish which made it the procedure of choice until the middle of the nineteenth century when the advent of anesthesia made the high operation preferable and when lithotrity and lithalopaxy were perfected. He was in the vanguard of general surgeons of the eighteenth century who cast off the shackles of Hippocrates' interdiction against cutting for stone. These men replaced the crude, unlettered, and frequently unscrupulous itinerant lithotomists who operated after sunset and wandered off before dawn. Alghisi brought to his task a thorough knowledge of anatomy; and he applied to it the general precepts of surgery, as true and as difficult to learn today as in his time. Some of these precepts were: to treat the patient as a whole and not merely his disease, to be gentle, to avoid blood loss ("blood is Life's treasure"), to allow contaminated wounds to heal by granulation and not to attempt primary closure, to secure adequate exposure by liberal incisions. Two technical contributions, though seemingly minor, were of great importance. The first was a silver cannula of large caliber which was inserted into the bladder through the perineal urethral incision for continuous postoperative vesical drainage. Although urethrostomy drainage had been advocated by

others, the caliber of the catheters had been inadequate to assure free urinary drainage, the *sine qua non* of safe vesical surgery. And many advocated no drainage at all. His second technical contribution sprang from the principle that surgical operations must be fitted to the patient rather than that the patient be forced to conform to a standardized operative procedure; and to this end he devised instruments of graded caliber and curvature to cope with anatomical and clinical variations encountered from patient to patient.

We can only speculate about what further achievements Tommaso Alghisi might have made had his career not been ended so early by his tragic death.

ACKNOWLEDGMENT

I am indebted to my late friend, His Excellency, Signor Girolamo de' Rossi of Candeglia, in whose home I spent many of my leaves during the late war, and who directed my search for material for this paper.

I am also indebted to Dr. Giustiniano degli Azzi of Florence, who supplied me with copies of hundreds of records, photographs, and photostats from the Archives of Florence, from which most of the information for this paper was obtained.

I am grateful also to the Historical Section of the Armed Forces Medical Library for the use of books and for their prompt and accurate photostat service.

And I am most grateful to the bookshop in a small, forgotten alley in Florence where I found Alghisi's *Litotomia* among a mountain of books piled on the damp floor.

37 *Raccolta di Armi delle Famiglie Nobili e Cittadine di Firenze*, Tome I, c. 208 (Arch. di Stato di Firenze).

Dr. Koch's Postulates

LESTER S. KING*

IN 1882 Robert Koch published his epoch-making study[1] of the tubercle bacillus and its causative rôle in the disease tuberculosis. During the period from 1860 to 1890 there were identified specific organisms associated with numerous contagious diseases: leprosy, anthrax, typhoid, gonorrhea, tuberculosis, cholera, and many others. These discoveries marked a great advance in concrete practical ways of handling the diseases in question, and for medical theory as well. But Koch as a great pioneer was more than a great bacteriologist. In addition to inventing new techniques and applying them to old problems, he stressed certain logical principles which are well worth examining. These principles, which are popularly called Koch's postulates, can be understood only in their context, in relation to the problems that were current at the time.

What we call tuberculosis today was not always a precise definite entity. Such different terms as miliary tuberculosis, caseous bronchitis, phthisis, scrofula, bovine tuberculosis, and many others, were recognized, with no universal agreement as to whether they were all manifestations of the same condition. The means of identification of the disease lay through inexact pathological findings and a quite variable clinical course. Before Koch, the identification of the disease or any of its forms was a matter of judgment and dispute.

In the first flush of bacterial discoveries, many investigators had studied tuberculosis. Certain methods for staining bacteria in general had been evolved, and certain techniques for cultivating the organisms outside of the body had been developed. These early methods were astoundingly successful when applied to many diseases, but in the study of tuberculosis they seemed unavailing. Koch quotes experiments of Klebs and of Schüller and Toussaint who had indeed isolated organisms from tuberculous material. But such work was not convincing.

Koch made his great advance by developing a totally new staining method and elaborating a different type of culture medium. With the help of these technical aids, he demonstrated and

* Chicago, Illinois.

1 Koch, Robert. Die Aetiologie der Tuberculose. *Berl. klin. Wschr.*, 1882, *19*, 221-230. Reprinted and translated in *Medical Classics*, 1938, *2*, 821-880.

described a bacterium not hitherto known. With very careful work he studied a wide variety of tuberculous tissues from human lungs, brain, intestine, lymph nodes, and joints, as well as from cattle, pigs, fowl, monkey, guinea pig, and rabbit. In all, without exception, he was able to stain a characteristic bacterium of special properties. In all cases studied, then, this bacillus was found. But, argued Koch, "it does not necessarily follow from this coincidence of the tuberculous disease and the bacilli that the two phenomena have an original association." To prove the causative rôle of the bacillus "the bacilli had to be isolated from the body and cultivated in pure culture until devoid of all adherent products of disease originating from the animal organism; and, finally, through transfer of the isolated bacilli to animals, the same clinical picture of tuberculosis as is obtained empirically by the injection of naturally developed tuberculous material had to be produced."

With his new techniques Koch was readily able to isolate the bacillus in culture medium, to transmit it serially in pure culture outside of the body, and then at any time to inject it into animals to produce the disease. He showed in great detail that cultures could be made from diseased tissue of widely differing source; that these cultures could, in turn, be injected by a great variety of routes into a wide variety of animals. In all cases, without exception, the disease tuberculosis resulted, and the bacilli could in turn be recovered. He utilized suitable controls to eliminate the possibility of spontaneous infection.

What Koch accomplished, in brief, was to demonstrate for the first time in any human disease a strict relation between a microorganism and a disease. Recovery of a bacterium is not enough, since in tuberculosis, for example, other workers, as mentioned above, had identified bacteria. Nor is transmission of the disease enough. Transmission merely indicates an infectious nature, and the infectious nature of tuberculosis was already fairly well established. Koch's contribution was in forging a chain of evidence which connected a specific bacterium and a given disease. So strong was this chain, so convincing the demonstration, that his principles have been exalted as "postulates" and considered a model for all future work.

Although Koch himself did not emphasize these logical principles, nevertheless it is with his name and work that the so-called postulates are associated. The usual formulation is as follows: (i) The microörganism is present and discoverable in every case

of the disease, (ii) it is to be cultivated in a pure culture, (iii) inoculations from such culture must reproduce the disease in susceptible animals, and (iv) it must be re-obtained from such animals and again grown in a pure culture.[2]

The history of yellow fever also exemplifies in striking fashion certain principles of causality relevant to the postulates of Koch. Very early in its history certain features were noticed about yellow fever, such as its prevalence in warm moist climates, its frequent appearance in seaport towns, its disappearance with the onset of cool weather. Its contagiousness was always prominent, yet the means by which it was spread long remained unknown. In the absence of any known agent, or any recognized means of transmission, superstitions were relied upon to avoid infection. Yet even in 1793 the possibility of a mosquito being involved was suspected by Benjamin Rush. In the nineteenth century several other observers were struck by the same thought, but no adequate evidence was adduced until 1881, when Carlos Finlay[3] presented well-reasoned arguments in favor of this hypothesis. Finlay, having accumulated many observations in regard to the epidemiology of yellow fever, tried to find some factor which would explain the data. Transmission, he felt, could be explained only through an insect vector, and of the possible vectors the mosquito seemed most admirably adapted. And of all the mosquitoes, one particular species (originally called *Culex cubensis,* later called *Stegomyia fasciata* or *Aedes egypti*) appeared to satisfy the requirements.

Now, Finlay did two admirable services. Through a process of acute observation and reasoning, he not only accumulated data, but also framed specific hypotheses which, if correct, would be a satisfactory explanation of these data. But a hypothesis, by itself, exerts no cogency without definite *ad hoc* evidence. So Finlay set out to gather evidence, performing some acute and daring experimentation to prove these hypotheses. His own evidence, in light of modern knowledge, is entirely erroneous, yet his hypothesis has been proven correct.

The brilliant work of Walter Reed and his co-workers in proving the correctness of Finlay's hypothesis is well known. The Yellow Fever Commission clearly demonstrated that yellow fever was not spread by ordinary direct or indirect contact with the

[2] Dorland, W. A. N. *The American illustrated medical dictionary.* 22d. ed. Philadelphia, W. B. Saunders Co., 1951.

[3] Finlay, Carlos. El mosquito hipoteticamente considerado como agente de transmisión de la fiebre amarilla. *An. Real Acad. Cienc.,* 1881, *18,* 147-169. Reprinted and translated in *Medical Classics,* 1937-8, 2, 569-633.

patient, but by the bite of a specific mosquito (the *Aedes egypti*) which had previously bitten an infected patient. The mosquito was not infective until a lapse of 12 to 14 days after feeding on a patient. The evidence, most carefully gathered and fitted together, indicated the cyclic character of the infectious process. If the cycle could be broken through elimination of the mosquito, the disease could be brought under control. Getting rid of the mosquito was the means of preventing natural infection of humans. The elimination of the mosquito in Panama, for example, was one of the remarkable sanitation achievements of the century. Yet, although the disease could be controlled in practical fashion, the actual offending transmissible agent, the agent which the mosquito sucked up and then later re-injected, was not known.

Even before the Yellow Fever Commission was so successfully active, various investigators had been trying to discover this transmissible agent. Different claimants were brought forth, one or another bacterium was hailed as *the* agent, usually on flimsy evidence. One particular agent received especial attention, the so-called bacillus icteroides of Sanarelli.[4] This bacillus Sanarelli claimed to have recovered from autopsies on yellow fever patients. It could be recovered and grown in pure culture and was pathogenic for animals with symptoms suggestive of yellow fever. Mice, guinea pigs, and rabbits succumbed to injections and the dog was especially susceptible.

The bacterium produced a filterable toxin. Sanarelli injected the toxin into men and claimed that relatively small doses reproduced in man "typical yellow fever, accompanied by all its imposing anatomic and symptomatologic retinue—the fever, congestion, haemorrhages, vomiting, steatosis of the liver, cephalalgia, rachialgia, nephritis, anuria, icterus, delirium, collapse—in short, all that complex of symptomatic and anatomic elements which in their combination constitute the indivisible basis of the diagnosis of yellow fever."[5]

Although the claims of Sanarelli were accepted by some students and even received some alleged confirmation, the work did not hold up. Agramonte[6] showed that the organism was present only in a small percentage of yellow fever patients and was, on the other hand, recoverable from many individuals who positively were not

[4] Sanarelli, G. Etiologie et pathogenie de la fievre jaune. *Ann. Inst. Pasteur*, 1897, *11*, 433-522; 673-766.

[5] Sanarelli, G. A lecture on yellow fever, with a description of the bacillus icteroides. *Brit. med. J.*, 1897, *2*, 7-11.

[6] Agramonte, A. Report of bacteriological investigations upon yellow fever. *Med. News*, 1900, *76*, 203-212.

ill with yellow fever. It was to be considered only as a contaminant. In spite of Sanarelli's belief that he could reproduce the original disease with filtrates of his organisms, more cogent means of identification were needed. Was he justified, on the basis of the fever, vomiting, hemorrhage, degeneration of the liver, and so on—was he justified on the basis of these superficial similarities in asserting an identity of conditions? Clearly no. In difficult problems reliance cannot be placed on general similarity of symptoms or superficial resemblances. Mere opinion was not the only available criterion, for techniques of serology and immunology even then offered considerable assistance. After immunological tests, Agramonte claimed Sanarelli's organism to be related to the organism of hog cholera.

A further example of the tragic errors associated with yellow fever is offered by Noguchi.[7] The work of Reed and his associates showed that whatever the agent proved to be, it would have to be transmissible by the Stegomyia mosquito after an incubation period of 12 days. And further, Reed was able to show that the agent was of very small size, so small that it could pass through the pores of a porcelain filter. Considerable evidence had by this time accumulated defining the properties of the agent. No claim could be seriously considered unless it conformed to various demonstrated epidemiological and immunological criteria. Noguchi claimed that the infectious transmissible agent was a spirochete. His method was apparently straightforward enough. From patients with yellow fever he was able to isolate a particular spirochete. This he was able to grow in pure culture. Then, by inoculating the spirochete into guinea pigs he reproduced an illness very similar to that of the original human patients. Koch's postulates, apparently, were fulfilled. In addition, many of the known facts about yellow fever were explained by his discovery. Thus, the spirochete was able to pass through a porcelain filter, it could be transmitted by the *Aedes egypti* after a 12- to 14-day interval, and it reacted to antibodies in convalescent serum. Noguchi's chain of evidence included pathological, bacteriological, immunological, and epidemiological factors.

Now unfortunately there is a disease somewhat similar to yellow fever, having many of the same clinical features and known sometimes (erroneously) as infectious jaundice, sometimes as Weil's disease. The cause of this condition also had been obscure, but in

[7] Noguchi, H. Etiology of yellow fever. *J. exp. Med.*, 1919, *29*, 547-596; *30*, 1-29, 87-107, 401-410; 1920, *31*, 135-168.

1916 a spirochete was isolated and speedily accepted as the agent at fault. The disease, thenceforward, was frequently called spirochaetal jaundice. Noguchi became well acquainted with this organism. The spirochete which he recovered from the cases of yellow fever he found to be closely related to the spirochete of Weil's disease.

Noguchi studied yellow fever in Ecuador, where 172 "typical" or "classic" cases were made available to him. Actually, he recovered spirochetes from only a small percentage of total patients tested. How valid were any conclusions that he drew? It speedily became apparent that all cases of yellow fever did not harbor the spirochete. Other investigators, working with yellow fever in Brazil and in Africa, could not confirm his findings at all and denied the etiological importance of the spirochete.

Something seemed to be wrong. For an agent to be considered etiological in Koch's sense, it must be found in all cases of the disease, or, if not found, some satisfactory reason explaining the discrepancy must be forthcoming. But Noguchi's opponents declared simply that yellow fever is not due to a spirochete at all, that Noguchi had confused spirochetal jaundice with yellow fever, that the physicians who, in Ecuador, had made the original diagnosis of yellow fever were mistaken. Noguchi himself had considerable doubts about his own work. In one of his papers he mentions as the source of his material "the disease known as yellow fever in Guayaquil."[8] All the difficulty came from confusing "the disease yellow fever" and "the disease known as yellow fever in Guayaquil." Noguchi assumed, or acted on the assumption, that these terms were identical. His opponents denied they were identical.

The rest of the story is well known. Noguchi went to Africa, a very discouraged man, and there he succumbed to the "real" yellow fever. The disease from which he isolated a spirochete is now universally believed to have been spirochetal jaundice. The evidence that he adduced to prove the similarity of clinical yellow fever and the disease produced by his spirochete today appears rather flimsy. In crucial experiments his percentage of positive results was rather low, considerably lower than would be required for cogency. In retrospect it is quite remarkable that they were ever thought to be at all convincing. Today the agent of yellow

[8] Noguchi, H. Etiology of yellow fever. X. Comparative immunological studies on leptospira icteroides and leptospira icterohaemorrhagicae. *J. exp. Med.*, 1920, *30*, 135-158.

fever is recognized as a specific filterable virus, with specific immunological reactions which serve for its identification.

II

These two brief sketches raise certain important methodological problems. We may ask, how do we know if we have a case of tuberculosis or yellow fever? In regard to tuberculosis, we might say in casual fashion, "By demonstrating the tubercle bacillus. If we can demonstrate the bacillus, the patient suffers from tuberculosis. If we cannot so determine, he may still have the disease, but on the other hand, he may not and we cannot be sure."

This line of reasoning is essentially that offered by Koch himself. He clearly realized that, by the discovery of a specific agent, he rendered precise the field of tuberculosis. Because of his work a definite criterion was at hand for the identification of the disease. No longer need pathologists or clinicians dispute whether a given case is or is not tuberculosis. Instead of vague standards of tissue structure, such as tubercles or giant cells, Koch offered a precise standard, namely, the identification of the tubercle bacillus. According to this scheme, when the bacilli are identified, the case is one of tuberculosis *by definition*.

But this line of reasoning is not capable of generalization. Instead of a patient with tuberculosis, let us take one with, say, diphtheria. Diphtheria, as described in textbooks and as ordinarily seen in practice, is a specific disease to which a characteristic bacterium stands in the same relation as Koch's acid-fast bacillus does to tuberculosis. Diphtheria is defined by identification of the *C. diphtheriae*. But, as was discovered long ago, identification of the specific bacterium does not by itself make a diagnosis of the disease diphtheria. People who are apparently perfectly healthy, or, perhaps, are suffering from headache, or sore toe, or indigestion, may yield *C. diphtheriae* from their throats. Should we say, then, that the diphtheria bacillus is the cause of the headache, sore toe, or indigestion? Clearly not.

It was long ago demonstrated that many pathogenic bacteria, which are quite closely related to certain specific diseases, may be found in so-called carriers, that is, apparently normal persons who harbor the germ but show no clinical evidence of the disease. Carriers bear some sort of immunity which in some cases may have been the result of a previous infection, usually inapparent or subclinical. Our only concern at present is with the well-established

fact that the presence of a specific bacterium does not necessarily indicate a specific disease. All that is proven by the recovery of a specific bacterium is that the bacterium has been recovered. To establish the *disease,* somewhat more is necessary. That is, there must be a congeries of symptoms and signs, history, and laboratory data, all of which may vary within wide limits, but which together form an approximate unity, a *gestalt* or configuration. In the absence of this configuration, the diagnosis cannot be made. A specific bacterium does not mean that a corresponding disease is present. The recovery of a bacterium is significant only in conjunction with other features. If other factors, as represented by various physical, temporal, and laboratory data, are too divergent, the identification of the disease must remain suspect.

We can see, then, that Koch's claim for establishing the etiology of tuberculosis cannot be accepted at its face value. He himself well realized that other factors were important either in producing the disease or inhibiting its development. It is necessary to emphasize that the tubercle bacillus is merely one factor in determining the infectious disease tuberculosis, an indispensible factor, to be sure, but not of itself adequate without taking into account many others.

In terms of logic we say that the tubercle bacillus is a necessary but not a sufficient cause for the production of tuberculosis. We also say that the tubercle bacillus forms one of the *defining factors* of the disease tuberculosis. With any disease the discovery of an "etiology," in Koch's sense, furnishes a factor in the definition of the disease; but there is no compulsion in the word "etiology" in the sense of being both necessary and sufficient.

How do we know if we are dealing with a case of yellow fever or of tuberculosis? Suffice to give this answer: We determine whether the case before us conforms to the *definition* of the disease, in which definition the presence of the transmissible agent is a necessary factor, but nevertheless only one factor among many.

Productive of great difficulty is the third postulate, that the infectious agent, i.e., the microörganism, will, upon inoculation into suitable animals, reproduce the disease. How would we know if we reproduced the original disease? Illustrations from the history of yellow fever are especially apt. Sanarelli, we saw, recovered a bacterium whose toxin, injected back into humans, produced what he thought was again yellow fever. As criteria, Sanarelli relied on hemorrhage, congestion, fever, vomiting, collapse, and so on, as manifested by his human subjects. Noguchi, injecting his spiro-

chete into guinea pigs, relied on a similar group of findings. Granted that the humans or the guinea pigs were sick, did they have the same disease as the patients from whom the microbial agents were recovered?

Yellow fever, perhaps, is a good example of the logical fallacy of begging the question on a truly colossal scale. Investigators have started with a patient whom they call an example of the disease under study. From this patient they recover some microbiological agent whose etiological connection is assumed. When injected into animals, the agent produces disease symptoms suggestive of the original condition. But obviously, a disease in guinea pigs is not identical with a disease in humans in spite of any similarities. Now comes the circular reasoning. The recovered organism is assumed to be the cause of the human condition. In proof, the investigator points to the disease produced in guinea pigs. But how do you know that the disease in guinea pigs is fundamentally or essentially similar to the disease in humans? Because it is produced by the same agent which "causes" the disease in humans. This reasoning which blandly assumes what requires to be proven is the type of reasoning indulged in, for example, by Sanarelli. It is clearly invalid. For cogency in demonstration further extensive evidence must be forthcoming.

Many accepted disease agents which produce a fairly characteristic clinical picture in man are also pathogenic for lower animals. But the disease produced in the lower animals is quite distinct from that found in man. Tuberculosis, to be sure, is substantially similar, and in many essential respects the experimental disease reproduces the natural human infection. But let us consider another prevalent human condition, lobar pneumonia, an infectious disease whose transmissible causative agent we recognize to be the pneumonococcus. This organism is found in the sputum of patients with the disease and by appropriate technical methods can be cultivated and isolated in pure culture. If such a pure culture of pneumococci is injected into the peritoneum of a mouse, the mouse will die. But it will succumb not to lobar pneumonia, but to peritonitis. The pneumococcus is indeed pathogenic for the mouse, killing the animal quite rapidly, but the mouse, in succumbing, *does not reproduce the human disease*. On the basis of these data alone, one would not be justified in alleging that the pneumococcus is the cause of lobar pneumonia, the disease of humans. Other approaches are necessary to establish the cause.

A similar example is observed with diphtheria which, in the human, attacks the throat (the rare cutaneous diphtheria is not in question here). The membrane of diphtheritic patients, if injected into a guinea pig, will prove lethal. The specific bacterium, *C. diphtheriae,* can be isolated in pure culture from diphtheritic membranes. This bacterium will reproduce all the effects of the original inoculum and, by Koch's type of analysis, must be considered the active agent. We can go further and show that a soluble toxin given off by the *C. diphtheriae* produces all the harmful effects of the bacteria. Nevertheless, the guinea pig does not reproduce the disease, diphtheria, as it is found in humans. If we consider Koch's postulates as ordinarily given, they are not fulfilled in the case of diphtheria in the guinea pig, any more than pneumococcus in the mouse. *A* disease has been produced, but is it *the* disease?

Actually, this question is of no particular importance. It makes very little difference whether a disease transmitted to animals reproduces the original disease of humans. The important thing is that there be a correlation between a human disease and some manifestation in an experimental animal. The condition in the artificial host must be a *function,* in the mathematical sense, of the condition in the original host. There must be a constancy of response so that, given certain attendant circumstances, certain results may be predicted and verified; given variations in the original host, concomitant variation can be demonstrated in the experimental host. Thus, all the brilliant work on diphtheria toxin, with its important immunological and chemical principles, has utilized the guinea pig as the test animal. And, as emphasized above, the guinea pig does not reproduce the human disease diphtheria. The experimental animal serves as an *indicator* for the activity of the transmissible agent. Can this active agent be inhibited by antibodies? Can it be obstructed by various therapeutic substances? Can variations in activity be correlated with variations in age, sex, or nutrition? How does the agent behave under varied conditions? Numberless questions of this type may be answered if some experimental indicator is at hand to make the answer legible.

This type of functional correlation is the only way in which the behavior of viruses may be studied. Since viruses cannot be seen directly, some indirect evidence of their presence must be forthcoming. This indirect evidence is the effect the viruses produce in animals. If no experimental animal is susceptible, then there is no

way of observing the presence or absence of the virus, let alone its functional correlates with other states or conditions. Advance in the study of a virus disease is usually dependent on the discovery of a susceptible host. If that host happens approximately to reproduce the original disease, well and good. But such reproduction is not essential.

Two points of caution must be raised. In the first place, the proof of a functional relationship between a microbiological agent and a disease rests on a variety of grounds. The closer the similarity between original and transmitted disease (for example, tuberculosis in humans and guinea pigs), the simpler and more direct is the proof of the functional relationship. However, the experimental host may, in manifesting the disease, show very little similarity to the original condition. Thus, equine encephalomyelitis virus, recovered from encephalitis cases, is fatal to chick embryos, in which the disease bears very little obvious relation to the original disease. To demonstrate a causal or, as we prefer to say, a functional relationship, it is necessary to be much more rigorous. The absence of contamination, for example, must be unquestionably established, and immunological specificity, as, through carefully controlled protection tests, must be convincing and unequivocal. The egg embryo may be blighted by so many possible agencies that all agents other than the virus in question must be excluded beyond a reasonable doubt. The way in which such inferences are established forms part of the study of causation. The validity of inference, in general, is a special branch of logic with which Koch's postulates are not co-terminous. The point is important in demonstrating that an "etiological" relationship of an agent to a disease can be very adequately accomplished without reproducing the disease. It is sufficient to reproduce *a* disease which shows close correlations with the original. It is the correlations which are important.

It is our belief that what commonly passes for Koch's postulates, in all textbooks examined, is a misstatement and misinterpretation of what Koch actually meant. The difficulty revolves around the phrase "reproduce the disease." This can be, and is, interpreted in the sense of "yielding a replica of the original disease," but this interpretation, as we have seen, is neither necessary nor cogent. At best the original condition is not duplicated, but merely suggested, with numerous similarities yet also numerous differences. And at the opposite end of the scale the induced condition may bear very

little direct similarity to the original disease. The significant feature is not the degree of similarity, but the degree of functional correspondence, in other words, the degree to which the relationships are logically valid.

Examination of Koch's original paper shows that he did not in any way demand the duplication of the original disease. To interpret Koch's postulates we must start, first of all, with a disease which is proven to be infectious. We must also be aware that some crude infectious material (i.e., blood, sputum, feces, necrotic tissue) is capable of transmitting the infection. Koch's postulates come into play in determining exactly what precise agent is the responsible factor *within the crude infectious material.* If, for example, we show that pneumonia is infectious and that the sputum carries the infection, then we can apply Koch's postulates to the sputum to find out which organisms are contaminants and which, if any, is the "etiologic agent."

Let us say that we determine the infectiousness of the sputum by injecting it into mice. Then we could culture the sputum and recover, say, five different organisms, each of which is propagated in pure culture. By injecting each of these into mice we might find that four are harmless, but that the fifth always kills the mouse. By Koch's postulates, according to Koch's own words, the fifth culture could be considered the etiology. Koch specifically states, as quoted above in reference to tuberculosis, that the isolated bacteria must produce "the same clinical picture . . . as is obtained empirically by the injection of naturally developed" material. With pneumonia, the only demand would be that whatever effect the whole sputum produces must be produced also by the pure culture of the isolated bacteria. More than this Koch does not say.

It would seem that the uncritical enthusiasm of later commentators has saddled Koch with expressions that he did not intend. Koch's postulates as ordinarily interpreted are not logical or cogent, and there is no adequate evidence that Koch so intended them. The determination of etiology is a considerably more complex subject than is indicated by the postulates. Perhaps textbooks might dispense with consideration of the postulates and substitute therefor a discussion of the canons of induction and the validity of inference, that is, an analysis of what we mean by "cause."

An Illustrated Treatise on Cauterization in a Codex of the "Passionarius Garioponti"†

LUIGI BELLONI*

GARIOPONTUS or Guarimpotus (d. about 1050) is regarded as the most notable representative of the first period at Salerno (pre-Arabian)—"the Oribasius of the School of Salerno" (De Renzi), "the Giotto of the medical renaissance in the West" (Puccinotti). He is the presumed author of the *Passionarius,* which enjoyed such favour that it often was attributed to Galen himself, and was issued three times in the first half of the sixteenth century.[1] The prototype of Salernitan treatises, it eschews theoretical and metaphysical digressions; simple and straightforward, it set out to contribute to the medical practitioner's education and to serve as a companion in his professional duties. It gave a clear exposition of the basic elements (definition, symptomatology, therapy) of the several diseases. It is essentially a textbook of special pathology and therapy in five books followed by an appendix *De febribus,* divided sometimes into two and sometimes three books. The *Passionarius* is a typical encyclopaedic compilation, a "summa medicinae" whose author, availing himself of previous works of the same type, reproduced and elaborated literary excerpts from classical authors, from Hippocrates and Galen, as well as from the late Roman period (chiefly Theodorus Priscianus), and the Byzantine epoch.

The best known manuscripts, beside those mentioned by Haller,[2] are the Basiliensis recorded by De Renzi,[3] the Laurentianus described by Bandini[4] and Puccinotti,[5] the Angelicus de-

† Codex Ambrosianus D 2 inf., saec. XII.

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1 Galeni Pergameni passionarius a doctis medicis multum desideratus; aegritudines a capite ad pedes usque complectens, in quinque libros particulares divisus, una cum febrium tractatu earumque sintomatibus. Lege igitur et ne tibi mens hebes fuerit, eundem Galeni, et non alterius, ut falso quidam credunt, esse perpendens. Lugduni, 1526.

Garioponti vetusti admodum medici ad totius corporis aegritudines remediorum ΠΡΑΞΕΩΝ libri V. Eiusdem de febribus, atque earum symptωmatis libri II. Recens typis commissi, & multis in locis suae integritati restituti. Basileae, 1531.

Habes sincerioris medicinae amator, iterum renatos VIII de morborum causis, accidentibus & curationibus libros Garioponti medici, qui usu et successu artis nemini ex veteribus cedit, testibus qui usi sunt eius remediorum ratione indicationeve. Basileae, 1536.

2 Haller, A. *Bibliotheca medicinae practicae.* Bernae & Basileae, 1776-1788, Vol. I, pp. 267, 294, 427.

3 De Renzi, S. *Storia documentata della Scuola medica di Salerno.* Naples, 1857 (2d ed.), p. 173.

4 Bandini, A. M. *Catalogus codicum latinorum Bibliothecae Mediceae Laurentianae. . . .* Florence, 1776, Vol. III, col. 75-77.

5 Puccinotti, F. *Storia della medicina.* Naples, 1860, Vol. II, Part I, p. 336.

scribed by Puccinotti[6] and Giacosa,[7] to which was added, in 1909, the codex in the Royal Library of the Hague described by Geyl.[8] Most likely the number of manuscripts not yet discovered exceeds those that are known. Just as in the first printed edition (1526)[1] the treatise may in fact be attributed to Galen without the slightest mention of Gariopontus.

This is exactly what happened in the Codex Ambrosianus D 2 inf.,[9] a vellum manuscript of 82 folios measuring 15.5 cm. by 20.5 cm. The last two folios are covered with prescriptions and notes of various kinds and written in a fifteenth century hand (folio 82 is mutilated by a large hole torn in it). The remaining eighty folios are subdivided into five fascicles of sixteen leaves each. The text, which I have been able to identify with that of the *Passionarius*, begins about the middle of folio 16^{v} with the words "INCIPIT PROLOGUS PRIMI LIBRI GALIENI OBTIMI MEDICI" and the following preamble: "Si quis intente cognoscere desiderat intencionem tocius libri, prius cursim hec prenotata capitula prelegat que brevi eulogio in fronte libri huius notata reppererit. Quibus cognitis, intencionem tocius libri cognoscere poteris. Hec est via que tibi monstrat inflexus et recursus libri sequentis. Quam si sequeris nullus error te seducet quin recte pervenias ad calcem librarie intencionis. Que si memoriter tenere poteris erit tibi gloria et uniuscuiusque passionis et curationis bene poteris esse conscius. Et ita per singulos libros breviter capitula prenotata reperies." This proem, which, apart from a few variant readings, is identical with that contained in the Codex Laurentianus and Codex Angelicus, precedes the list of chapters of the first book ("INCIPIUNT CAPITULA I LIBRI: I De dolore capitis . . ."). The treatise is written in a Caroline minuscule which may be dated from the twelfth century and ends (mutilated) at the foot of folio 80^{v} with the words: "Quorum stomachus curandus est fomentis calidis, id est ex oleo calido, cui admiscendum est dum coquitur absinthium. . . ."[10]

[6] *Op. cit.*, pp. CVII-CIX.

[7] Giacosa, P. *Magistri Salernitani nondum editi*. Turin, 1901, pp. 356-357.

[8] Geyl. Zwei lateinische Handschriften aus dem 11. Jahrhundert, respective von Gariopontus und Constantinus Afer. *Janus*, 1909, *14*, 161-166. For other codices of the *Passionarius* see No. 52 (pp. 354-356) of Vitelli, C. Index codicum latinorum qui Pisis in bybliothecis conventus S. Catherinae et Universitatis adservantur. *Studi Italiani di Filologia Classica* (Florence), 1900, *8*, 321-427; and No. II (pp. 40-41) of Sigerist, H. E. Early mediaeval medical texts in manuscripts of Montpellier. *Bull. Hist. Med.*, 1941, *10*, 27-47.

[9] Prof. Henry E. Sigerist told me at Pura that he had examined this manuscript in 1933 and drawn attention to its importance on page 40 of his paper: "The Medical Literature of the Early Middle Ages. A Program—and a Report of a Summer of Research in Italy." *Bull. Hist. Med.*, 1934, *2*, 26-50.

[10] Corresponding to line 6 of p. 144 of the 1531 edition, and to line 5 of p. 436 of the 1536 edition.

Of the sixteen folios of the first fascicle, folios 4-13 are written in Gothic minuscule and contain an account of the life, activities, and teaching (prescriptions, phlebotomy, urines, deontology, etc.) of Hippocrates and Galen, or attributed to them. While these folios must in all likelihood be assumed to have been joined to the codex at a later period, the three pairs of corresponding folios, Nos. 1 and 14, 2 and 15, 3 and 16, most probably belonged to the manuscript from the very beginning since they exhibit many pieces written in the same Caroline minuscule as that of the *Passionarius*. Such pieces are:

a. The short illustrated treatise on cauterization on folios 2 and 3 (Figs. 1-4);

b. The prescriptions and classification of simples according to their actions on the human organism, on folios 14 and 15;

c. The lower half of folio 16^v containing, as mentioned, the *incipit* and the preamble of the *Passionarius,* together with the list of chapters of the first book.

Folio 1 was, however, scraped and then again covered with prescriptions written in the usual Gothic hand. Folio 16^r and the upper half of folio 16^v were likewise erased: the space thus gained was used by the same Gothic hand for adding a new prologue to the *Passionarius.* From this we learn that the treatise was divided into seven books and we may therefore draw the conclusion that *De febribus,* which is appended to the first five books, was divided into two books as in the printed edition of 1531.

The same Gothic hand, moreover, filled with writing the free space it found on folios 2^r and 3^v of the short illustrated treatise on cauterization. While the texts superimposed on folio 3^v (Fig. 4) ("FARINACUM GALIENI PRINCIPIS Medicorum post quem non fuit alius nisi minor et addiscens ab eo . . .") are still preserved, those written over folio 2^r (Fig. 1) were successively erased. Traces remain of them in the space between the lower extremities of the "DISCIpulus," in the space between the face and the upper right extremity of the surgeon in indication IV ("Ad dolorem capitis et maniacum . . ."), and in the letter "F" which is next to the open book held by Hippocrates. It is interesting to note, also, how the Gothic scribe put to use the words "summus medicus" written by the Caroline scribe (who referred them to "ypocras" in the upper part of folio 2^r) and completed them with "est xpūs (= Christus) et ceteri Medici sunt ministri, et cetera. . . ." The same religious spirit that clearly underlies also the second preamble later added

to the *Passionarius* (upper half of folio 16^{v}) suggests the logical inference that the Gothic resumption of the manuscript took place in monastic surroundings. A feature pointing in the same direction is the erasure of the hernial scrotum in indication XXI ("Ponderosus . . .") (Fig. 4). Folio 2^{r} was disfigured not only by writing, which for the most part was then erased, but also by the two ornaments in the margins at the side and at the foot of the page, the first drawn directly on the vellum of the folio, the second, however, glued over it.

Before passing to a description and transcription of the short illustrated treatise on cauterization contained in folios 2 and 3, it will be well to call to mind that the therapeutic use of cauterization was designed to utilize two very distinct modes of action: (i) a local action, i.e., direct application of the cautery to a superficial morbid tissue in order to destroy it or modify it in some manner or other; (ii) indirect action, i.e., application of the cautery to a healthy superficial area to the end of favourably influencing the course of a morbid process more or less removed and often deep-seated. The idea was to draw to the cauterized area a stream of offending humours in such a way as to eliminate it by way of the secretions of the artificially created wound.

The treatise consists of a series of XXII indications "at a remove," that is, it shows for each of them the chosen point or points for applying the cautery and the type of instrument ("cauterium latum," "cauterium rotundum").

It is well known that the use of cauterization goes back to the earliest times. One may recall in this connexion the last of Hippocrates' aphorisms whose interpretation is so highly controversial: "'Οκόσα φάρμακα οὐκ ἰῆται, σίδηρος ἰῆται· ὅσα σίδηρος οὐκ ἰῆται, πῦρ ἰῆται· ὅσα δὲ πῦρ οὐκ ἰῆται, ταῦτα χρὴ νομίζειν ἀνίατα." It is not by idle chance that our treatise opens and is dominated by the figure of Hippocrates ("ypocras summus medicus"), seated in his chair, holding in his left hand an open book and demonstrating with his right the rules of the art to the "DISCIpulus" who is seen in the act of cauterizing the "infirmus."

The sick man appears twenty-two times in all—the same number, that is, as that of indications for cauterization—now seated, now standing, and once lying stretched out on his back. In one figure he is completely naked, in another more or less dressed; again, he is seen from in front, or from the back, but always placed in such a way as to show on the bared surface of the body the point or points

selected. These are clearly indicated in the same brown ink in which the figures are drawn and the text written. The initials, on the other hand, are done in red ink, likewise the words "ypocras summus medicus," "DISCIPULUS," and "infirmus." In indication XI, the "Stomaticus et disintericus" has his legs quite clearly tied to a column. In this indication and in Nos. I, III, IV, V, VIII, IX, X, XII, XIX, XX, XXII it is very likely that the hands are tied on the patient's back. In II and VI, however, it is the patient himself who shows the point or points of application with his own hand. These are generally marked with a small point, or, less frequently, with a short line, and where this is the case (II, III, IV, V, VII) the draughtsman evidently wanted to mark the use of the "cauterium latum."

The pupil, in other words the surgeon, appears ten times (I, IV, V, VIII, IX, XI, XV, XVIII, XIX, XX), sometimes beardless or, again, bearded, but always wielding the cautery and always in the act of intervening at the point of choice. Only in the first indication does he hold a cautery in either hand. The cold end of the cautery in the majority of cases is bent at a right angle.

On the whole, the figures exhibit in their features, attitudes, and clothing a distinct note of archaism.

We shall now pass to the transcription of the text, proceeding from top to bottom, and from left to right.

Folio 2^r (*Fig. 1*). (I) Epilentici incenduntur sic. Retro in occipitio super utrasque auriculas duas cocturas facies cum cauterio lato. Et in anteriori parte quantum tenditur planta a superciliis cum cauterio rotundo facies unas cocturas.

(II) Ad oculorum lacrimas stringendum incenditur sic. Mensura ab aure de ambabus partibus uncias tres et incende cum lato cauterio.

(III) Ad tumorem capitis et gravedinem oculorum. In anteriori parte incenditur ita cum cauterio lato.

(IV) Ad dolorem capitis et maniacum incenditur sic. Retro tribus digitis ab utraque auricula cum cauterio lato et unam in anteriori parte cum cauterio rotundo quantum a naribus extenditur manus.

(V) Ad dolorem capitis et prefocationem incenditur sic. In anteriori parte capitis duo cauteria et duo ex utraque parte gutturis et uno in latere dextro cum cauterio rotundo.

Folio 2^v (*Fig. 2*). (VI) Ad reuma gingivarum incenditur sic. Intra mentum et labium cum cauterio rotundo.

(VII) Ad capitis dolorem et inflationem pectoris et manuum et genuculorum et pedum torciones incenditur sic cum cauterio rotundo in capite vero cum lato.

(VIII) Ptisicus incenditur sic. In anteriori parte in hunc modum. Posterius subter scapulas duo cauteria ponenda sunt rotunda.

(IX) Ad anelitum et dispniam incenditur sic videlicet in anteriori parte in hunc modum. Posterius subter scapulas duas et unam iuxta ilium dextrum cum cauterio rotundo.

(X) Empucus incenditur in hunc modum cum cauterio rotundo.

(XI) Stomaticus et disintericus incenditur sic. In stomacho facies quatuor cocturas in modum crucis et unam super umbilicum et alteram in sinistro latere proxima ilio.

Folio 3r (*Fig. 3*). (XII) Ydropicus incenditur[11] sic. In utroque latere facies ternas cocturas et unam sub umbilico.

(XIII) Epaticus incenditur sic. Una coctura sit sub catena dextra et due sub mamillis et una sub umbilico.

(XIV) Ad renum dolores incenditur sic. Unam cocturam facies inter ambas scapulas et duas in renes recte se inspicientes.

(XV) Ad renum et coxarum dolores incenditur sic. duas cocturas facies in renibus et duas aforis super sufragines et duas sub ieniculis planta distantes.

(XVI) Ad dolores de cilio incenditur sic. Ex utraque parte duas cocturas facies inter tempora et aures cum cauterio lato in modum stili facto.

(XVII) Ad tumores et dolores geniculorum vel pedum. ex utroque latere super et subter.

(XVIII) Sciaticus incenditur sic. Ex ea parte qua dolet facies tres cocturas in modum trianguli scilicet in eo loco ubi divisio ossium fit.

(XIX) Ad vulnus ruptum in stomacho et ad cardiacum incenditur sic. Tres cocturas inequales facies in pectore et duas super mamillas et quatuor ex utraque parte stomachi in modum crucis.

Folio 3v (*Fig. 4*). (XX) Spleneticus incenditur sic. In latere dextro in modum trianguli.

(XXI) Ponderosus incenditur sic. Duas cocturas facies ex utraque parte inguinis.

(XXII) Elefanticus incenditur sic.

Chronologically, the series of cauteries from the Ambrosianus is to be accorded one of the first places among the twenty illustrated texts of similar kind written in Latin and collected by Karl Sudhoff (1853-1938) in the course of a patient and protracted search which he continued in the principal libraries of Europe for many years.[12] As a result of studying these manuscripts, which

[11] These two words are repeated in larger characters in the upper margin of the folio.

[12] Sudhoff, K. Beiträge zur Geschichte der Chirurgie im Mittelalter. Graphische und textliche Untersuchungen in mittelalterlichen Handschriften. I. Teil. *Stud. Gesch. Med.*, 1914, Hft. 10, pp. 1-224, pl. I-LXV. II. Teil. *Ibid.*, 1918, Hft. 11-12, pp. 1-685, pl. I-XXIX. The series on cauterization is treated on pp. 75-124 (Pl. XV-XXXXI) of Part I and on pp. XV-XVII of Part II. For a summary of the first conclusions reached by the author in the course of these researches, cf. Sudhoff, K. Ein illustrierter Abriss der Kauterienbehandlung aus dem 12. Jahrhundert. *Münch. med. Wschr.*, 1908, 55, 2162.

range from the early eleventh (Cod. Laurentianus LXXIII 41) to the end of the fifteenth century, the great medical historian arrived at the conclusion that these schemes of cauterization have deep roots in antiquity and with a very high degree of verisimilitude go back to the School of Alexandria.

Be that as it may, it is certain that they reached the Middle Ages in the West by direct transmission from classical antiquity without the intermediary of the Arabians: this is amply borne out, quite apart from their appearance in manuscripts of the same age as the Laurentianus, by the simple form of the instruments depicted. It is well known that the Arabs avoided the knife and favoured cauterization instead. They greatly developed its instruments, devising the most diverse models of cautery to suit the various indications. One may readily deduce this by examining, either in a manuscript[13] or in a printed edition, the iconography of the first of the three books comprised by Albucasis' *Chirurgia.* Its fifty-six chapters are exclusively devoted to the treatment of internal and external diseases by cauterization.

During the Middle Ages, the series on the use of the cautery was religiously copied, excepting changes of detail, from codex to codex. As a straightforward teaching and memorizing scheme, easy to grasp, it was highly popular both with young pupils and the untutored members of the art (barbers). This explains two features: (i) The explanatory text accompanying the figures very soon was translated into the languages spoken in the various countries instead of being handed down in Latin. A typical example—which also has artistic merit—is the fourteenth century series in the vulgar tongue of Italy, published by Giuseppe Albertotti (1851-1936)[14]; (ii) The illustrated treatise on cauterization is quite often found in the codices in association with drawings and texts of an eminently practical nature: thus, in the Paduan manuscript of Albertotti, with a "venesection man," and in this Codex Ambrosianus, with a collection of prescriptions and the *Passionarius.*

[13] E.g., Cod. Ambrosianus R 76 sup., which on folios 1r-92v contains the *Chirurgia* of Albucasis in the Latin translation of Gerard of Cremona. An analogous case is the illustrated surgical instruments which occupy folios 85r-92r of Cod. Ambrosianus C 59 sup. containing the *Chirurgia* of Bruno da Longoburgo (folios 1r-80v).

[14] Albertotti, G. Di un trattato die cauterii in volgare contenuto in un codice figurato del secolo XIV della Biblioteca Pinali di Padova. *Atti Mem. R. Accad. Scienze, Lett. Arti, Padova,* 1908, *24,* 213-230.

Fig. 1. Folio 2r of Cod. Ambrosianus D 2 inf.

Fig. 2. Folio 2v of Cod. Ambrosianus D 2 inf.

Fig. 3. Folio 3r of Cod. Ambrosianus D 2 inf.

Fig. 4. Folio 3v of Cod. Ambrosianus D 2 inf.

History of the Rhesus Blood Types

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THE Rh or rhesus blood factor has supplied the key to two medical mysteries, namely, the cause of hemolytic transfusion reactions in patients receiving blood of their own A-B-O group, and the cause of an obscure blood disease of newborn infants known as erythroblastosis fetalis. In view of the importance of the Rh blood factor, it is natural that curiosity exists regarding the events leading to its discovery. With these investigations the name of the pioneering scientist Karl Landsteiner is intimately linked, and since I was fortunate enough to be associated with him in this early work, I accepted the kind invitation** to prepare an "eye-witness" account of the history of Rh.

The discovery of Rh was no accident, but the inevitable result of Karl Landsteiner's earlier work on blood groups and his basic investigations on the nature of antigens, antibodies, and their reactions. By applying and developing his ideas in later investigations on the complex Rh-Hr system of blood types, I succeeded in elucidating their serology and their heredity by a series of multiple allelic genes, at the same time devising a simple, compact method of designating the Rh-Hr types. The fact that even today a large number of workers still advocate and use a different, elaborate, alternate nomenclature for the Rh-Hr types which does not represent the facts correctly demonstrates that the basic immunological principles discovered by Landsteiner are not widely known and understood. In presenting this historical account, therefore, it will be necessary to explain some of these basic principles as well as the earlier history of blood grouping and transfusion, which led up to the discovery of the Rh factor.

Discovery of the A-B-O Blood Groups by Landsteiner

In the earliest attempts at blood transfusion of man by Denys in the seventeenth century, lamb blood was used, but these experiments were terminated when one of his patients died with symptoms caused by hemolysis. In the nineteenth century, Blundell performed a few transfusions using human blood donors, while others again attempted transfusions using lamb blood. The harmful reactions from the use of animal blood were explained in 1875

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when Landois and Ponfick demonstrated that human serum destroys or clumps blood from animals. The general ability of serum of one animal species to hemolyze the red cells of another is due to the presence in the serum of natural antibodies designated as heterohemolysins (or heteroagglutinins). At the turn of the century, Bordet, Uhlenhuth, and Nuttall carried these experiments further and showed that the blood of each animal species can be distinguished by serological tests.

In 1900, searching for individual differences in human blood, Landsteiner selected the simplest technique possible, namely, to mix the serum of one individual with the red cells of others. While in certain combinations no reaction occurred, in other combinations strong clumping resulted. By cross-testing members of his laboratory staff, Landsteiner then found that they fell into three blood groups. The fourth and rarest group, AB, was discovered the following year by DeCastello and Sturli, the latter a pupil of Landsteiner. Thus, the four blood groups were known in 1902 and are fully described also in Landsteiner's monograph (1907) on hemagglutination and hemolysis. It is important to emphasize this, because sometimes this discovery has been credited to Jansky for work done in 1907, or to Moss whose report appeared as late as 1910. Jansky and Moss merely devised two different methods of numbering the blood groups, and thus contributed confusion rather than knowledge to the subject. Another mistake sometimes made is to credit Shattock with the independent discovery of isoagglutination in 1899. Examination of Shattock's paper, however, shows that he was dealing with rouleaux formation instead. In his very first paper, Landsteiner pointed out that isoagglutination and the blood groups were the probable explanation for the unfavorable reactions sometimes observed after blood transfusions with human donors. Hektoen repeated this suggestion in 1907, while Ottenberg in America and Schultze in Germany in 1910 were probably the first workers actually to apply the tests for the selection of donors for transfusions. In 1930, Landsteiner was awarded the Nobel Prize in Medicine for the discovery of the blood groups as well as for his other pioneering work in immunochemistry.

In order to explain the blood group reactions, Landsteiner found it necessary to postulate the existence of two substances in the red cells designated by him as agglutinogens A and B, respectively. The four possible combinations, A alone, B alone, A and B together, and neither A nor B, correspond to the four blood

groups. In the serum there are two corresponding naturally occurring agglutinins, anti-A and anti-B. Obviously, the same healthy body cannot contain agglutinogen A and agglutinin anti-A at the same time. According to Landsteiner's rule, except in infants, there is a reciprocal relationship between the agglutinogens in the red cells and the agglutinins in the serum, so that, for example, the serum of a group O individual always contains both agglutinins, anti-A and anti-B. These findings explain why, for instance, transfusion of group A blood into group O individual is so dangerous, because the preformed isoantibodies in the recipient's serum can clump or destroy the donor's red blood cells. The International Nomenclature of the four blood groups using the letters, O, A, B, and AB, has superseded the obsolete Jansky and Moss numberings, because the former is more rational and is based on the serological properties of the groups.

Nature of Cross-reactions of Antibodies

To explain the specific nature of the combination between antibodies and their respective antigens, one may make use of the lock and key analogy introduced by Paul Ehrlich. For example, agglutinin anti-A may be considered the specific key for red cells A, but does not correspond to red cells B. To account for the occurrence of anti-A and anti-B agglutinins in human sera and also in animal sera (because animal sera also frequently contain agglutinins specific for A and B), one must invoke the concept of heterogenetic antigens and antibodies to which we shall refer again in connection with the discovery of the rhesus blood factor. Forssman demonstrated that a variety of antigens, such as horse serum, guinea-pig kidney, etc., had the common property of stimulating the production of antibodies capable of hemolyzing sheep blood; later, certain strains of bacteria were found to share this property. This is not due merely to the presence in all these diverse materials of an identical substance, however. Returning to our lock and key analogy; if we put "keys" anti-A and anti-B on the same "key ring," as in group O serum, we would be in a position to open both "locks" A and B. However, it would also be possible to manufacture a single "skeleton key" to open the two locks, A or B, which could be expected to have a more rudimentary structure than either key anti-A or anti-B. Similarly, presumably, heterogenetic antibodies are "skeleton keys" which fit a wide variety of antigens because of crude similarities in the surface properties of all

their molecules. In 1924, Schiff and Adelsberger showed that the human agglutinogen A belongs to the Forssman system of antigens, because certain anti-A immune rabbit sera also hemolyze sheep blood (similarly, certain anti-sheep immune sera react strongly with human group A blood). A good deal of evidence has accumulated that A-like and B-like substances are present in many microörganisms and there are strong indications that the natural anti-A and anti-B agglutinins are likewise of heterogenetic origin, resulting from latent or manifest infections with such microorganisms.

LANDSTEINER, FOUNDER OF THE SCIENCE OF IMMUNOCHEMISTRY

Following the discovery of the blood groups, Dr. Landsteiner busied himself with the puzzle of the nature and cause of the specificity of immunological reactions. Why, he inquired, when a patient recovers from measles, for example, does he become immune to measles but no other infectious disease? With Lampl, he introduced simple chemical substances into protein molecules by diazotization and was able to show that the specificity of the antigen thus formed depended on the chemical structure introduced. Antibodies were shown by other workers to be serum globulins, which presumably are modified in the manner in which their peptide chains are folded to conform with the surface of the antigen molecule. By studying cross reactions of antibodies against relatively simple chemical structures, Landsteiner showed that antigens elicited not merely a single corresponding antibody but a whole spectrum of antibodies of different specificities. Similarly, by studying the cross reactions of different human anti-A and anti-B blood on blood of lower animals, it has been possible to demonstrate that agglutinogens A and B behave serologically as if they had a mosaic structure. This "mosaic structure" has proved to be a universal property of agglutinogens, not only A and B, but also M and N, Rh-Hr, etc., and represents, at least in part, an artifact due to the ability of a single antigen to elicit and react with a multiplicity of antibodies, as demonstrated by Landsteiner and his co-workers in their studies on antigens of known chemical composition.

DISCOVERY OF AGGLUTINOGENS M, N, AND P

From the onset, Landsteiner had been convinced that a serological individuality of human blood exists comparable to that of the fingerprints. When he was invited to come to America in 1923

to become a Member of the Rockefeller Institute for Medical Research, he resumed his studies on the blood groups. With Levine in 1927, he injected human blood into rabbits and obtained antisera with which they discovered the three M-N types and the agglutinogen P. The agglutinogens M, N, and P are of little or no importance for the selection of donors for blood transfusions, because isoantibodies for M, N, and P occur only rarely in human sera, and then are, as a rule, of too low titer and avidity to cause a serious reaction. Successful experiments demonstrating further individual differences in human blood, with the aid of irregular isoagglutinins in human sera or by immunizing animals with human blood, confirmed Landsteiner's concept of a pronounced individuality of human blood. However, the antisera obtained were weak and the results were not readily reproducible so that no further substantial progress was made for another decade.

Intragroup Hemolytic Transfusion Reactions

In the meantime, it began to become increasingly apparent that the four A-B-O blood groups were not the complete answer to blood transfusion reactions. At first, to be sure, when transfusions were still a relatively infrequent procedure, almost all the hemolytic reactions were explainable by failure to take the blood groups into account, or by errors in blood grouping. Two such early reports by Astrowe and Thalhimer are worth mentioning, because they called attention to the phenomenon of isosensitization for the first time. Each patient was given a transfusion of blood believed to be compatible without any untoward reaction, but when after a fortnight second transfusions from the same donors were given, violent hemolytic reactions resulted. Thalhimer then found that his patient belonged to group O and the donor to group B. Astrowe's patient belonged to group O and the donor to group A. The first transfusions had been symptomless because the natural anti-A and anti-B agglutinins were of low titer, but the injected blood caused the recipient to produce potent *immune* isoagglutinins which were responsible for the reactions to the second transfusions.

As transfusions became a more common procedure, it became evident that occasional hemolytic reactions could occur even though patient and donor belonged to the same blood group. In 1922, Unger noticed that sometimes small clumps of cells were present in the cross-matching tests and if such blood was trans-

fused, reactions might occur. Landsteiner, Levine, and Janes studied post-transfusion sera, and in one case detected a weak irregular isoagglutinin giving reactions unrelated to the A-B-O blood groups. During the fourth decade of the present century, with the introduction of blood banks, thousands of transfusions were given daily and the occurrence of intragroup transfusion reactions could no longer be ignored. In a number of cases isohemolysins or isoagglutinins giving reactions unrelated to the A-B-O groups were detected in the recipient's sera. Among the most carefully studied of these cases are those reported by Culbertson and Ratcliffe, Pondman, Zacho, Neter, Mosonyi, and Levine, and Stetson. Usually, the patients had received previous transfusions without reactions, and it was concluded that the recipients had become isosensitized to an agglutinogen present in the donor's blood but absent from their own. Levine and Stetson's case involved a woman who had just had a stillbirth but no previous blood transfusion, and these workers suggested a second method of isosensitization by red cells of the fetus, which was to be applied later by Levine *et al.* in elucidating the pathogenesis of erythroblastosis fetalis. However, the final solution of the problem of intragroup transfusion reactions and isosensitization in pregnancy had to await the discovery of the Rh factor.

DISCOVERY OF THE RH FACTOR

In 1937, with Landsteiner I conducted a study of the evolution of the agglutinogens M and N in anthropoid apes and monkeys. From the cross reactions of the antisera, we showed that the agglutinogens M and N behaved as if they had mosaic structures, and that their partial antigens evolved in step-like fashion from the lowest monkeys through the anthropoid apes to man. Since M-like agglutinogens were found to be present in the blood of rhesus monkeys, we injected rhesus blood into rabbits and showed that it was possible in that way to produce anti-M sera (though, of course, qualitatively different from the antisera produced by injecting rabbits with human type M blood). As has already been mentioned, it had previously been found that anti-A sera could be produced by injecting sheep blood into rabbits, and it occurred to us that by continuing the line of investigation, namely, the injection of animal blood into rabbits, it might be possible to obtain antisera for hitherto unknown agglutinogens in human blood. In fact, further tests disclosed that some of the anti-rhesus immune

sera reacted specifically with blood from about 85 per cent of Caucasoids, the reactions being unrelated to A, B, M, N, and P. The new agglutinogen in human blood was designated Rh to indicate the manner in which it had been discovered, but we delayed announcing our finding while trying to improve the method of producing the anti-rhesus sera.

In 1939, with H. R. Peters I studied two puzzling cases in which patients had been given transfusions of blood of their own A-B-O group and yet sustained hemolytic reactions so severe that one of the patients died. In the sera of these two patients, and also in a third case, we demonstrated the presence of irregular agglutinins which clumped the red cells of the donors whose blood caused the hemolytic reactions. Moreover, the agglutinins in all three patients' sera gave parallel reactions, clumping the blood of approximately 85 per cent of Caucasians, independently of the A-B-O groups, and the M, N, and P factors. This suggested that the blood factor responsible might be the rhesus factor, and comparative tests proved this inference to be correct. All three patients were rhesus negative, while all the donors who had caused the reactions were rhesus positive. In the course of a year it was possible to assemble ten additional cases in which the rhesus factor was the cause of intragroup transfusion reactions, and other observers reported similar cases, so it became evident that the rhesus factor was the cause of the great majority of such reactions. In retrospect, it therefore seems reasonable to conclude that the majority of the earlier irregular agglutinins found in the sera of patients sustaining intragroup hemolytic reactions were also rhesus antibodies. This statement almost certainly applies to Mosonyi's and Pondman's cases, while the case of Zacho was probably due to the factor now identified as rh'. Moreover, Culbertson and Ratcliffe retested one of their cases after the discovery of the rhesus factor was reported and were able to prove directly that the antibody in their patient's serum was an anti-rhesus agglutinin; similarly, the case of Levine and Stetson was placed in this category by tests made by Levine and Katzin in 1941.

The Rh Factor and Erythroblastosis Fetalis

As already mentioned, Rh also provided the key to the mystery of erythroblastosis fetalis. As early as 1927, Lenart had tried to account for this disease on the basis of A-B-O blood group incompatibility between mother and fetus. According to him, icterus

levis and icterus gravis were merely different grades of severity of the same disease, presumably due to differences in the anti-A or anti-B titer of the maternal serum. Since, however, in most cases of icterus gravis the blood group of the fetus is compatible with the maternal serum, Lenart's theory was not taken seriously, and other hypotheses such as infection with liver damage were suggested. In 1938, Darrow again put forth a serological theory of pathogenesis of erythroblastosis, suggesting that the mother had become sensitized to fetal hemoglobin, which she had previously shown to be serologically different from adult hemoglobin. In 1941, Levine *et al.* and Burnham noticed, however, that women who had had stillbirths and erythroblastotic babies were particularly subject to intragroup hemolytic transfusion reactions. This suggested that the hemolytic transfusion reactions and erythroblastosis had a common pathogenesis, namely, isosensitization to the Rh factor. Indeed, Levine *et al.* found that in the great majority of cases the mothers of erythroblastotic babies are Rh negative with Rh agglutinins in their sera, while the babies are Rh positive. This work was quickly confirmed by other workers, and it was found that more than 90 per cent of the cases of erythroblastosis could be accounted for on the basis of Rh sensitization.

PRODUCTION OF ANTI-Rh SERA

The tests with the anti-rhesus immune rabbit sera were very delicate, but we succeeded in improving the method by using guinea pigs. But even the tests with guinea pig anti-rhesus serum would probably be too delicate for the average technician; nowadays the test has been simplified by the use of potent anti-Rh sera of human origin. Nevertheless, most of the early work such as the demonstration of the heredity of the Rh factor as a simple Mendelian dominant, was done with the guinea pig anti-rhesus serum, which served as a reference standard for other workers. For example, Moureau, working independently in Belgium, cut off from the rest of the world by the war, encountered an intragroup transfusion reaction in 1940, which he attributed to an irregular agglutinin in the patient's serum and which he designated provisionally as anti-X. Even though technical difficulties caused him to estimate the positive reactions as 75 per cent instead of 85 per cent, parallel tests with guinea pig anti-rhesus serum enabled Moureau to show that his anti-X was really anti-Rh.

It is easy to understand why anti-Rh sera of human origin give clearer reactions than anti-rhesus animal sera, because the former representing a response to the injection of human Rh-positive blood is an exact "key" for the "lock" while the latter is a "skeleton key." Interestingly enough, we found that while human anti-Rh serum agglutinates Rh-positive blood much more strongly than the animal anti-rhesus sera, they fail to clump rhesus monkey blood, another example of what Landsteiner has designated as non-reciprocal reactions and at the same time demonstrating the mosaic behavior of the Rh agglutinogen. On the other hand, Fisk and Foord found that the animal anti-rhesus sera clumped *all* bloods from newborn babies, whether Rh positive or Rh negative, and even more strongly than adult Rh-positive blood.

Ready sources of human anti-Rh sera were patients who had had intragroup transfusion reactions and mothers of erythroblastotic babies. Experimental studies on the production of anti-Rh sera in human volunteers were then undertaken by us, and I found that the spacing of the injections was more important than the dosage and the number of injections. A minimum of two injections spaced four months apart was usually required; the first injection apparently acted as a "primer" while the second or later injection caused the release of the specific antibody whose titer reached its peak after a fortnight. These observations served to explain why intragroup hemolytic transfusion reactions affected primarily patients with blood dyscrasias or recurrent hemorrhage, who required repeated transfusions over a period of many months or years.

Rh Blocking Antibodies

It was early observed, in many instances of intragroup hemolytic transfusion reactions and severe erythroblastosis manifestly due to Rh isosensitization, that Rh agglutinins could not be demonstrated in the patient's sera by the classic agglutination method in saline media. In 1941, it occurred to me that the Rh antibodies might exist in two forms, one capable of combining with Rh-positive cells in saline media but without clumping them. It was not until 1943, however, when larger amounts of suitable human anti-Rh agglutinating sera became available, that I succeeded in devising the blocking test to demonstrate this "blocking" Rh antibody. Working independently, Race in England and Diamond in America encountered the blocking antibody when pooling anti-Rh_0 and anti-rh′ sera in an unsuccessful attempt to produce polyvalent

agglutinating anti-Rho′ sera. In order better to visualize the reactions, I postulated that the blocking Rh antibody was "univalent" while the agglutinating antibody was conceived to be "bivalent." This led me to conclude that the blocking Rh antibody was probably of smaller molecular size. Indeed, we found that the blocking antibody readily passes through the normal human placenta, while the agglutinins are held back by the intact placental barrier. Thus it is the Rh blocking antibody that causes erythroblastosis by passing through the placenta and coating the fetal cells, and not the Rh agglutinins as originally postulated by Levine *et al.* In this way puzzling stillbirths and transfusion reactions without demonstrable Rh agglutinins were accounted for, and recent work has shown that, as was to be expected, there is a close correlation between the titer of the univalent Rh antibodies in the maternal blood and the severity of the manifestations in the erythroblastotic baby.

The original blocking test was relatively insensitive and detected univalent Rh antibodies only when present in high titer, but soon more sensitive and satisfactory direct methods of demonstrating these antibodies were devised, notably the conglutination test (Wiener, Diamond), the anti-globulin test (Coombs *et al.*), and the test with red cells treated with proteolytic enzymes (Morton and Pickles). The occurrence of more than one form of antibody could hardly be peculiar merely to Rh antibodies but must be a property shared by antibodies of all specificities, in refutation of the unitarian hypothesis. In fact, methods analogous to the conglutination test had been used prior to the discovery of Rh, while as early as 1908 Moreschi had used the anti-globulin technique as a sensitive method for demonstrating antibodies for red cells and bacteria. However, because of the elaborate nature of the anti-globulin test and lack of full appreciation of its significance, this important test was apparently forgotten for about forty years until it was rediscovered by Coombs *et al.* in connection with the Rh tests.

THE Rh-Hr BLOOD TYPES

The study of isoimmune human sera has caused rapid advances in the field of blood grouping during the past decade. As early as 1900, with the aid of immune goat isohemolysins, Ehrlich and Morgenroth had demonstrated the existence of a multiplicity of individual differences in goat blood. Again in 1910, Todd and White used iso-immune cattle sera to demonstrate multiple individual differences in cattle blood, and similar results were obtained

by the same method in the study of blood from dogs, rabbits, horses, and chickens. As Landsteiner pointed out, a similar individuality undoubtedly existed in the case of human blood, and his prediction was fulfilled when human anti-Rh sera were studied. In 1941, we found that while the great majority of human anti-Rh sera gave reactions paralleling the original anti-rhesus animal sera, many human antisera gave divergent reactions due to existence of more than one Rh factor. Human sera giving reactions paralleling the original anti-rhesus sera were designated anti-Rh_o; two additional varieties of Rh antisera designated anti-rh′ (70 per cent positive) and anti-rh″ (30 per cent positive) were also identified. With the three Rh antisera, I was able to identify eight "standard" Rh types. Meanwhile, in 1941, Levine and Javert encountered a serum reacting with all Rh-negative bloods as well as certain Rh-positive blood, which they designated as anti-Hr. Two such reciprocally reacting sera have been found, namely, anti-hr′, and anti-hr″, while anti-Hr_o has not been identified with certainty to date, if it exists at all.

The recent history of the Rh-Hr types repeats in many respects the earlier history of the A-B-O blood groups. In the case of the A-B-O blood groups, three rival theories of heredity were under consideration at one time, namely, heredity by independent pairs of allelic genes, *A-a* and *B-b*, or heredity by linked gene pairs, or heredity by multiple allelic genes. In 1924, Bernstein pointed out that if there were separate pairs of genes for A and B, the following relation between the frequencies of the four blood groups had to hold, AB x O = A x B. The fact that the relation does not hold, as well as the results of studies on family material, showed that the blood groups are inherited by multiple allelic genes. The same problem arose when it was found that there is more than one kind of Rh factor; by a similar calculation and by family studies I was able to demonstrate that the Rh-Hr types are inherited by multiple allelic genes. Thus, the Rh agglutinogen has a complex mosaic structure with factors, Rh_o, rh′, rh″, hr′, and hr″ as partial antigens. Unfortunately, the British investigators Race and Fisher, apparently unfamiliar with the early history of the blood groups and Landsteiner's work on the mosaic structure of agglutinogens, have sponsored the incorrect theory of inheritance of the Rh-Hr types by separate gene pairs which I had previously discarded, and have made this the basis of a second system of notations for the Rh-Hr types. Recent work by Stormont and collaborators on the B and C

blood groups in cattle, and Briles and collaborators on blood groups in fowl have further demonstrated the validity of the concept of agglutinogens as having a complex mosaic structure and inherited by multiple allelic genes, and it is hoped that a full appreciation of the significance of these newer findings will help resolve the unnecessary and confusing controversy concerning nomenclature of the Rh-Hr types.

APPLICATIONS IN ANTHROPOLOGY AND LEGAL MEDICINE

It should be mentioned that besides their importance for medicine, the rhesus system of blood types has valuable applications in the sciences of anthropology and legal medicine. While no particular A-B-O group, M-N type, or Rh-Hr type is peculiar to any specific ethnic group, the distributions of the various blood group factors are characteristically different in the different races. Here the elaborate system of Rh-Hr types has yielded the most striking results, and I found, for example, that Negroids are characterized by a very high frequency of type Rh_0 (about 50 per cent) in contrast to the low frequency of this type in other races; Caucasoids are characterized by the highest frequency of type rh; while Mongoloids have no or hardly any type rh with the highest frequency of the rare gene R^z. In legal medicine, blood grouping has been applied most frequently in cases of disputed parentage. Here again the complex system of Rh-Hr types provides the greatest chance of excluding paternity, and by the combined use of all three systems, A-B-O, M-N, and Rh-Hr a falsely accused man has more than a 50 per cent chance of being exonerated.

OTHER BLOOD GROUP SYSTEMS

In conclusion, it should be mentioned that present knowledge of the human blood groups has advanced far beyond what it has been possible to indicate here.

Variants of the various agglutinogens have been found; for example, two chief varieties of agglutinogen A exist, A_1 and A_2, and similar variants have been found of the agglutinogens M and N, and the various Rh-Hr agglutinogens. Recently, moreover, a new pair of agglutinogens, S-s, related to the agglutinogens M and N have been found, so that the simple system of three M-N types has now been elaborated into a complex M-N-S system of nine blood types inherited by a series of four allelic genes. Moreover, by applying the newer methods of detecting antibodies to the study

of post-transfusion sera and sera from mothers of erythroblastotic babies, additional systems of blood groups have been discovered, notably K-k (Kell-Cellano), Lutheran, Lewis, and Duffy (Fy).

It is regrettable that Karl Landsteiner could not have lived to witness these newer developments which his pioneering discoveries and ideas made possible.

SELECTIVE BIBLIOGRAPHY ON RH*

A. Discovery of the Rh Factor; Hereditary Transmission

1. Landsteiner, K. and Wiener, A. S. An agglutinable factor in human blood recognized by immune sera for rhesus blood. *Proc. Soc. exp. Biol., N. Y.*, 1940, *43*, 223. (First paper on Rh.)
2. Landsteiner, K. and Wiener, A. S. Studies on an agglutinogen (Rh) in human blood reacting with anti-rhesus sera and human isoantibodies. *J. exp. Med.*, 1941, *74*, 309-320. (First paper on Rh genetics.)
3. Wiener, A. S. Karl Landsteiner, his work and the rhesus factor. *Current med. Dig.*, Aug. and Sept., 1951. (Passano Foundation Award Address.)

B. Rôle of Rh in Pathogenesis of Intragroup Transfusion Hemolysis

4. Wiener, A. S. and Peters, H. R. Hemolytic reactions following transfusions of the homologous group with three cases in which the same agglutinogen was responsible. *Ann. intern. Med.*, 1940, *13*, 2306-2322. (First paper showing rôle of Rh in transfusion reactions; reviews previous observations on intragroup transfusion reactions.)
5. Levine, P., Katzin, E. M., Vogel, P., and Burnham, L. The antigenicity of the Rh blood factor in transfusion and pregnancy; its rôle in the etiology of erythroblastosis fetalis. Chapter XXXI in Mudd, S. and Thalheimer, W.: *Blood substitutes and blood transfusion*. Springfield, Ill., C. C Thomas, 1942.
6. Wiener, A. S. Hemolytic reactions following transfusions of the homologous group. II. Further observations on the rôle of property Rh, particularly in cases without demonstrable isoantibodies. *Arch Path., Chicago*, 1941, *32*, 227-250.

C. Rôle of Rh in Pathogenesis of Erythroblastosis Fetalis: Clinical Aspects

7. Levine, P., Katzin, E. M., and Burnham, L. J. Isoimmunization in pregnancy; its possible bearing on the etiology of erythroblastosis fetalis. *J. Amer. med. Ass.*, 1941, *116*, 825. (First paper showing rôle of Rh in erythroblastosis.)
8. Levine, P., Burnham, L., Katzin, E. M., and Vogel, P. The rôle of isoimmunization in the pathogenesis of erythroblastosis fetalis. *Amer. J. Obstet. Gynec.*, 1951, *42*, 925-941. (Classic paper on Rh in erythroblastosis; first mention of Hr.)
9. Wiener, A. S. and Wexler, I. B. The management of the isosensitized pregnant patient and her erythroblastotic infant. *Med. Clin. N. Amer.*, 1951, *35*, 749-770.

D. Rh Sensitivity: Antibody Testing

10. Wiener, A. S. A new test (blocking test) for Rh sensitization. *Proc. Soc. exp. Biol., N. Y.*, 1944, *56*, 173-176. (First description of Rh blocking antibodies.)
11. Wiener, A. S. Conglutination test for Rh sensitization. *J. Lab. clin. Med.*, 1945, *30*, 662-667. (Fundamental paper on the subject.)
12. Diamond, L. K. and Abelson, N. M. The demonstration of anti-Rh agglutinins: an accurate and rapid slide test. *J. Lab. clin. Med.*, 1945, *30*, 204. (The first description of the important slide test.)

* This bibliography contains many of the leading articles and reviews on the subject. The reviews (section N) may be consulted for additional references by those desiring a more complete bibliography.

13. Coombs, R. R. A., Mourant, A. E., and Race, R. R. A new test for the detection of weak and "incomplete" Rh agglutinins. *Brit. J. exp. Path.*, 1945, *26*, 255. (One of the most sensitive tests for Rh sensitivity.)

14. Morton, J. A. and Pickles, N. M. Use of trypsin in the detection of anti-Rh antibodies. *Nature, Lond.*, 1947, *159*, 779-780. (First description of an important, new, simple, and sensitive test for Rh antibodies.)

E. The Rh-Hr Types and Their Heredity

15. Wiener, A. S. Genetic theory of the Rh blood types. *Proc. Soc. exp. Biol., N. Y.*, 1943, *54*, 238-240. (Theory of multiple alleles.)

16. Wiener, A. S. Heredity of the Rh blood types. VII. Additional family studies, with special reference to the genes R^z and r^r. (*Proceedings of the Eighth International Congress of Genetics.*) *Hereditas*, 1949, *35*, (Supp.), 500-519.

17. Wiener, A. S. The Rh-Hr blood types: serology, genetics, and nomenclature. *Trans. N. Y. Acad. Sci.*, 1951, *13*, 199-205.

F. The Hr Factors

18. Levine, P. Pathogenesis of erythroblastosis fetalis; a review. *J. Pediat.*, 1943, *23*, 656.

19. Mourant, A. E. A new rhesus antibody. *Nature, Lond.*, 1945, *155*, 542. (First observation of hr″.)

20. Wiener, A. S. Theory and nomenclature of the Hr blood factors. *Science*, 1945, *102*, 479.

G. Rh Variants

21. Wiener, A. S. The Rh series of allelic genes. *Science*, 1944, *100*, 595-597. (First paper on Rh variants.)

22. Rosenfield, R., Vogel, P., and Miller, B. The detection of weakly reacting Rh_0 (D^u) factor. *Blood*, 1951, *6*, 1123-1134.

23. Wiener, A. S. and Gordon, E. B. Studies on the blood factor rh^w. *Amer. J. clin. Path.*, 1949, *19*, 621-629.

H. Rh Nomenclature

24. Boyd, W. C. Present status of the Rh blood types and nomenclature. *Amer. J. phys. Anthrop.*, 1949, *n.s. 7*, 519-527.

25. Wiener, A. S. Heredity and nomenclature of the Rh-Hr blood types. *World Health Org. Bull.*, 1950, *3*, 265-278.

26. Wiener, A. S. Rh Glossary. *Dade County med. Assoc. Bull.*, 1949, *20*, 20-23; also in *Laboratory Digest*, May 1949. (This terse survey of the basic facts of Rh serology and genetics has been published also in German, French, Spanish, Italian, and Portuguese.)

I. Racial Distribution

27. Boyd, W. C. *Genetics and the races of man.* Boston, Little Brown and Co., 1950. 453 pp.

28. Simmons, R. T., Graydon, J. J., Semple, N. M., and Green, R. The A_1-A_2-B-O, M-N, and Rh blood groups in Southern Chinese; Hak-Kas, Cantonese and Hakkiens. *Med. J. Aust.*, 1950, *2*, 917-922.

29. Wiener, A. S., Zepeda, J. P., Sonn, E. B., and Palivka, H. R. Individual blood differences in Mexican Indians with special reference to the Rh blood types and the Hr factor. *J. exp. Med.*, 1945, *81*, 559-571.

J. Transfusion Therapy of Infants with Erythroblastosis

30. Diamond, L. K. Replacement transfusion as a treatment for erythroblastosis fetalis, *Pediatrics*, 1948, *2*, 520-525.

31. Wallerstein, H. Substitution transfusion: a new treatment for severe erythroblastosis fetalis. *Amer. J. Dis. Child.*, 1947, *73*, 19-33.

32. Wiener, A. S. and Wexler, I. B. The use of heparin when performing exchange transfusions in newborn infants. *J. Lab. clin. Med.*, 1946, *31*, 1016-1019.
33. Wiener, A. S. Treatment of erythroblastosis by exchange transfusion. *Postgrad. med. J.*, 1950, *7*, 1-10.

K. Other New Blood Types

34. Bertinshaw, D., Lawler, S. D., Holt, H. A., Kirman, B. H., and Race, R. R. The combination of blood groups in a sample of 475 people in a London hospital. *Ann. Eugen., Lond.*, 1950, *15*, 234-242.
35. Cutbush, M. and Mollison, P. L. The Duffy blood group. *Heredity*, 1950, *4*, 383-389.
36. Grubb, R. Observations on the human blood group system Lewis. *Acta path. microbiol. scand.*, 1951, *28* (1): 61-81.
37. Levine, P., Wigod, M., Backer, A. M., and Ponder, R. The Kell-Cellano (K-k) genetic system of human blood factors. *Blood*, 1949, *4*, 869-872.
38. Sanger, R., Race, R. R., Walsh, R. J., and Montgomery, C. An antibody which subdivides the MN blood groups. *Heredity*, 1948, *2*, 131-139.

L. Medicolegal Applications in Disputed Paternity

39. Schatkin, S. B. *Disputed paternity proceedings.* 2d ed. New York, Matthew Bender and Co., 1947. 614 pp.
40. Wiener, A. S. Blood grouping in disputed parentage, with special reference to the Rh-Hr blood types. In *Proceedings of the Third International Congress of the International Society of Hematology*, Cambridge, England, August 1950. New York, Grune & Stratton, 1951, pp. 207-220.

M. Blood Groups in Animals. Experimental Erythroblastosis.

41. Briles, W. E., Irwin, M. R., and McGibbon, W. M. Multiple alleles affecting cellular antigens in the chicken. *Genetics*, 1950, *35*, 633-652.
42. Stormont, C., Owen, R. D., and Irwin, M. R. The B and C systems of bovine blood groups. *Genetics*, 1951, *36*, 134-161. (A brilliant analysis of the complicated blood groups of cattle, demonstrating the mosaic structure of agglutinogens, and heredity by multiple allelic genes. A significant contribution to the understanding of Rh-Hr genetics in man.)
43. Young, L. E., Ervin, D. M., Christian, R. M., and Davis, R. W. Hemolytic disease in newborn dogs following isoimmunization of the dam by transfusions. *Science*, 1949, *109*, 620-631.

N. Reviews and Symposia

44. Landsteiner, K. *The specificity of serological reactions.* Rev. ed. Cambridge, Mass., Harvard University Press, 1945. 310 pp. (For a basic understanding of the Rh-Hr types, one must read Landsteiner's concept of the mosaic structure of agglutinogens, pp. 113-116.)
45. Pickles, M. *Hemolytic disease of the newborn.* Springfield, Ill., C. C Thomas, 1949. 181 pp.
46. Race, R. R. and Sanger, R. *Blood groups in man.*, Oxford, Blackwell Scientific Publ., 1950. 290 pp.
47. Wiener, A. S. The Rh blood types and some of their applications. *Amer. J. clin. Path.*, 1945, *15*, 106-121.
48. Wiener, A. S. *Blood groups and transfusion.* 3d ed. Springfield, Ill., C. C Thomas, 1943. 438 pp.
49. Wiener, A. S. Problem of the rhesus antigen in medicine. Pp. 439-480, in Dock and Snapper's *Advances in internal medicine II.* New York, Interscience Publ., Inc., 1947.
50. Wiener, A. S. Recent developments in the knowledge of the Rh-Hr blood types; tests for Rh sensitization. *Amer. J. clin. Path.*, 1946, *16*, 477-497.
51. Wiener, A. S. and Wexler, I. B. The mosaic structure of red blood cell agglutinogens. *Bacteriological Reviews*, 1952, *16*, 69-87.

Dr. Edwards Crisp: A Forgotten Medical Scientist

JESSIE DOBSON*

It is no uncommon happening that a man, by reason of his acceptibility to his contemporaries, gains a reputation considerably in advance of his real merits. It is left for time to adjust the business and it is a fortunate thing that the final verdict is commonly a just one. But it is equally true that there are some who, failing to gain the esteem of their fellows, suffer eclipse in their lifetime so far as the appreciation of their works is concerned. With these, time commonly does not deal so fairly. Contemporary neglect and contemporary suppression are like to make their effects felt for long; and time may not bring just restitution, unless some unlooked-for circumstance forces recognition of a merit that was not acknowledged during a man's lifetime. Time and circumstance play tricks with every man's reputation: but for some it would seem that oblivion had been so inevitably ordained that just recognition could never be obtained.

It seems incredible that a man who won the Jacksonian Prize on two occasions and to whom the Astley Cooper Prize was twice awarded and one who was the author of no less than 328 contributions to medical and scientific literature, could have had scant obituary notices in 1882 in which his merits were only grudgingly acknowledged and be practically unknown today.

In the Hunterian Museum of the Royal College of Surgeons of England there were, before the disaster of 1941, no less than 39 specimens prepared by a Dr. Crisp to illustrate his original investigations in comparative anatomy. Of these, unfortunately only 22 remain and all of them illustrate his work on the comparative anatomy of the spleen and include specimens showing the valves in the splenic vein, the existence of which he was the first to demonstrate. Crisp ranks with Astley Cooper, Richard Owen, and other well-known men in his contribution of specimens of comparative anatomy to this Museum, but unlike them this "Dr. Crisp" receives no mention in standard works on medical biography. It is in an

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endeavour to bring to a wider notice the work of this indefatigable investigator that the present paper is written.

Edwards Crisp was born at Rendlesham, Suffolk, on 10 December 1806, the son of a gentleman farmer. He was educated at the Grammar School, Ipswich, and in 1823 was apprenticed to Dr. Cream of Long Melford. For two years he studied at the combined medical schools of St. Thomas's and Guy's. In 1828 he became a Licentiate of the Society of Apothecaries and in the following year a member of the Royal College of Surgeons. He then studied in Paris for two years and not only acquired a wide knowledge of French methods in medicine and surgery, but also became proficient in the language. In 1830, he set up in practice in Brixton, London, but soon moved to Walworth Road and during the next sixteen years built up a large and lucrative practice. At the same time he wrote numerous short papers, most of which were published in the *Lancet,* and completed a larger work, entitled "The anatomical structure and diseases of the larger blood vessels," for which he gained, in 1844, the Jacksonian Prize of the Royal College of Surgeons. Encouraged by this success and by the attention that his other writings had attracted, he determined to devote more of his time to research and accordingly sold his practice, spent some time studying in Dublin, and then went to St. Andrews where in 1848 he gained the degree of M.D. In December 1848 after his return to London, he presented himself as a candidate for the licence of the Royal College of Physicians, but he was rejected by the examiners. In submitting himself to examination his "only motive for wishing to join this College was the difficulty of obtaining any public appointment without its licence," so that he does not appear to have held a very high opinion of the College even before he was rejected as a candidate. His examiners were Drs. Paris, Todd, Alderson, Nairne, and Sutherland and at the termination of the examination, Dr. Paris (the President) informed him of his rejection "for want of practical experience." Dr. Sutherland, evidently in order to soften the blow, added, "Dr. Crisp can come up again in six or twelve months." To this, Crisp replied, "Do you think, Sir, I will ever appear at this Board again? I consider it an *honour* to be rejected by such men." As Crisp had been qualified for twenty years and had been in the active practice of his profession, this verdict came as a severe shock to him. He at once published a pamphlet, entitled "The examination of a rejected candidate at the Royal College of Physicians" (1848), in

which he detailed all the circumstances of the examination, giving the questions, both written and oral, and his answers to them. Most certainly, Crisp had a very strong case in the fact that when, at the conclusion of the examination, he asked the Secretary to preserve his papers, he was told that they were already burnt. Since the burning of a candidate's papers was contrary to the regulations of the College, and since the burning was done on an order from the examiners, Crisp suggests that "they intended to reject me from the beginning." His deduction may or may not have been correct, but the proceeding was a highly irregular one, and subsequent correspondence with the authorities of the College only tended to confirm his belief that it was no casual disregard of the regulations that dictated the burning of his papers.

This first pamphlet was followed by another entitled "Examination of the President and Examiners of the Royal College of Physicians" (1849), and it must be admitted that the strictures he passed on everyone connected with the examinations and the governance of the College were very severe. In his second pamphlet he says that to have accepted Dr. Sutherland's suggestion "would have been the more politic course, but policy is not a word in my vocabulary." It would seem that in this candid statement lies the explanation of Crisp's eclipse during his lifetime and even his failure to secure a posthumous reputation as an enlightened reformer, an authoritative writer on medical subjects, and a comparative anatomist of considerable originality and distinction. Most certainly no motive of policy ever held him back when he considered that injustice had been done. It must be remembered that he was forty-two years of age at the time of his examination at the College of Physicians. He had already won the Jacksonian Prize and had published over thirty original papers in medical journals. He had studied in Paris as well as in Dublin and St. Andrews and was contemplating retiring from private practice in order to become a London physician. It may well be that this unfortunate experience marked a turning point in Crisp's life and in his attitude towards his professional fellows and especially towards the corporate bodies responsible for medical education and the safeguarding of the interests of the profession. At any rate, this is certain, that before 1848 his writings consisted almost entirely of contributions to clinical medicine; but after that date he becomes conspicuous as a bitter critic of orthodoxy as typified in the medical corporations and examining bodies of the time.

In November 1849 he was appointed Physician to the Metropolitan Dispensary, the only public appointment he ever held. In spite of his disappointment at his lack of success in the academic field, he did not cease his investigations into clinical problems and into comparative anatomy and pathology. An indication of his enormous capacity for work is the fact that in March 1850 was published the first number of a journal edited and conducted by him, entitled *The London Medical Examiner*. In his preface to the first completed volume (1 February 1851), Crisp as Editor states that he 'knew the enemies he was sure to make, and the uncharitable constructions that many would put upon his motives: he determined, however, to act fearlessly and honestly; to endeavour to go to the *root* of the many abuses that disgraced his profession, and in *all instances to suggest a remedy for these evils*. By way of keeping up the character for vanity and egotism, which will be readily accorded him, he now boasts that the LONDON MEDICAL EXAMINER was the first Journal to advocate openly and without reserve, a One Faculty of Medicine, Public Examinations, Hospital Statistics, Election by Concours, Public Convalescent Hospitals, and the necessity for placing the large Metropolitan Hospitals under the control of Government; he has, moreover, the consolatory belief that *all* these changes will hereafter be effected.' He took the opportunity of reprinting in full in this journal his pamphlets on the "Examination of a rejected candidate" and the "Examination of the President and Examiners of the Royal College of Physicians." The journal appeared for only two years (March 1850—October 1852) but it was instrumental in bringing to light many injustices and ill practices on the part of the corporate bodies presiding over medical practice. Among these might be mentioned the affair of the Swiney Cup which was to be awarded to the *author* of the best published work on jurisprudence. The adjudicators were the members of the Society of Arts and the Fellows of the College of Physicians, "with the wives of such of both as may be married." Quite contrary to this ruling, the President of the College of Physicians (Dr. Paris) appointed three Fellows of the College and three Members of the Society of Arts to act as adjudicators and these gentlemen, on 20 January 1849, awarded the Cup to the *joint authors*, Dr. Paris and Mr. Fonblanque, for their work on "Medical Jurisprudence" published twenty-six years previously, a work of which Dr. Crisp says, "It would be a waste of time to

attempt to criticise this treatise, or to endeavour to find a page of it that is free from error."

In his "History of the Hunterian Museum," in the same journal (December 1851), he says, "We should be the last to object to Parliamentary grants for scientific purposes. We are desirous, as we have before stated, that there should be a *National* Museum and Library in every large town in the United Kingdom. We would not, however, allow dukes, lords, and bishops, to be trustees of these museums, unless they had shown by their industry, and by their knowledge of the subjects over which they were to have the supervision, that they were competent for the office. We have no veneration for names and titles, except when the individuals possessing them are worthy of the people's gratitude; and plain John Hunter, in our estimation, is as far superior to the lordly appellation, as a well cultivated field is to the barren mountain—the one may be more lofty, but the other is infinitely more useful." In an earlier paper in the journal (November 1850), he had made some criticism of the manner of disposal of the College funds and remarks, "We also requested to ascertain what Mr. Lawrence and others received for the delivery of the Hunterian Orations, etc. We should like to know how much money the examiners put into their pockets? how much is spent upon dinners?" but in this later article he concentrates on the dereliction of duty on the part of the College as regards the trusteeship of the Hunterian Museum. He maintains that the College accepted the trust because "by this means they were enabled to obtain a new charter from the King with permission to examine for diplomas and add to their *own power* and *pecuniary aggrandisement.*" Crisp asserts that although fifty-two years had elapsed since the College took charge of the Museum, no catalogue of the collection had yet been prepared. (This, however, was incorrect, for Richard Owen's Catalogue was published in 1840.) Of the Trustees appointed for the Collection, Crisp observes that "the greater number of them would not probably know the difference between the skeleton of the shark and the cormorant; the sloth and the beaver." These are only a few of the indictments levied against the College of Surgeons, and he has similar criticisms of the College of Physicians and Society of Apothecaries, a company of which he says that it "exercises a despotic power more worthy of the days of the Tudors."

In the *London Medical Examiner* of March 1851, Crisp published "The Hunterian Oration [14 February 1851] that would

have been delivered by a member of the College of Surgeons, of London, if permission had been granted to him by the President and Council." It is in this and other papers in the same journal that he outlines his plan of medical reform and proposes, among other things, the formation of a faculty of medicine, composed of all the practitioners who have obtained diplomas in the United Kingdom. The advantage of this to the medical student would be that "instead of being crammed as at present, for one examination, with 'grinder's knowledge,' he would have time to prepare for the various subjects, and obtain information that would not vanish as soon as acquired, but would serve him in time of need. The publicity of the examination would also ensure him fair-play; and would not allow the vagaries and crotchets of the examiners to operate to his prejudice." He also urged "the destruction of the present system of nepotism and corruption in hospital appointments, so that the patrons of the Lord Noodles and of the Alderman Stenches would not encumber the Temple of Science, and close the gates to her true worshippers."

In 1851, Crisp won, for the second time, the Jacksonian Prize, for his investigation into "The causes, diagnosis and treatment of obstruction of the intestines within the abdomen." In 1853, he submitted an essay on the "Structure and Use of the Spleen" for the Astley Cooper Prize, but the prize was awarded to Henry Gray (of Gray's Anatomy fame), who was more than twenty years his junior. The result of the competition was another great disappointment to him, and, as was his wont, he immediately launched an attack upon the examiners and upon the writings of the successful candidate. As is usual in all his polemical writings, a great deal of very pungent comment on everyone concerned with the examination somewhat detracts from the very evident fact that some injustice certainly seems to have been done to him. Among the conditions attached to the award of the Prize was the stipulation that the work "shall not have been previously published and that the identity of the candidates shall not be known to the examiners." In Gray's case both these requirements seem to have been disregarded. In 1852, he was awarded a grant of £100 "for investigations concerning the spleen" and the results of these investigations were published in the *Philosophical Transactions* in January 1852, nearly two years after the subject for the prize essay had been announced. In the same year, Gray was elected a Fellow of the Royal Society at the very early age of twenty-five and the Royal Society

paper was "copied nearly verbatim" in the Prize Essay. The identity of the writer of the essay must therefore have been well known to the examiners for the Astley Cooper Prize, especially, as Crisp very pointedly says, "three of the adjudicators were Fellows of the Royal Society." The long "Appendix" published at the end of Crisp's book, *A Treatise on the Structure and Use of the Spleen* (his own unsuccessful essay for the Prize, which he published in 1855), deals with so many minutiae and becomes so discursive that it tends to detract from the weight of his very pertinent charges that in the award of the prize the basic conditions governing it were not complied with. Undoubtedly his cause was a just one, but it is not difficult to understand why the presentation of his case did not win for him a martyr's crown. Less than ten years after his winning the Astley Cooper Prize, Gray was dead and although Crisp outlived him by more than twenty years, Gray's name is today a household word with medical students, and Crisp is unknown even to the more enlightened members of the medical profession. His first failure did not prevent him from again competing for the prize; and his essay "On the Structure and Use of the Thyroid Gland" gained it for him in 1859, and his work "On the Pancreas" for a second time in 1862.

In 1861 the same train of events that had occurred in connection with his first candidature for the Astley Cooper Prize was re-enacted in connection with the John Hunter Medal and the Triennial Prize of the Royal College of Surgeons, which was awarded in that year to Professor George Harley. Harley's essay "On the Suprarenal Bodies" had won the prize and Crisp's had been rejected. The next year Crisp published a "Letter sent to the President and each of the twenty-four Councillors of the Royal College of Surgeons of England." He again contends (probably quite rightly) that "the identity of the successful essayist was well known to the adjudicators—Messrs. Hilton, Quain and Cock," and that Harley's essay was compounded of matter previously published by the author in a variety of scientific journals. Again his charges seem to have been well justified, but the "Letter" cannot be said to have been a very diplomatic nor even a very convincing presentation of the justice of his case. It produced no further result than a formal letter from the Assistant Secretary stating that "the Council, having decided the question referred to therein, decline to re-open it."

In 1861, when John Thomas Quekett, the Conservator of the Museum, died, Crisp applied for the vacant post. On 5 October

of that year, the *Lancet* called attention to the vacancy and added: "The names of several candidates have been made known. Amongst those most prominently mentioned are Professor Rainey, Mr. Parker, Mr. Stewart, Dr. Edwards Crisp and Mr. W. Flower." Of Crisp as a candidate, the *Lancet* said that he, like Flower, was "well known to combine an extensive acquaintance with zoology and general pathological experience." But on 7 December Crisp wrote a letter to the *Lancet* in which he objected, with great vigor, to the terms of the appointment and to the general attitude of the College towards the Conservatorship. Of the Conservator, he said, "He is expected, to use a zoological simile, to be a sort of College grub; to remain in the larva state until killed by the bad air of the house next door and that of the Museum vaults and the examination subjects." There was much other criticism of the College administration, and Crisp appears to have withdrawn his application. On 21 December the *Lancet* announced the appointment of "Mr. Flower, F.R.C.S., Assistant Surgeon to the Middlesex Hospital," and so another episode in Crisp's stormy career ended with his very trenchant criticisms of the administration of the College remaining unanswered.

His disappointments in some quarters were somewhat offset by his successes in others, however, for in 1864 his treatise on "Parasitic Diseases in the Lungs of Lambs" gained the Bath and West of England Prize Essay and in 1872 he won the Fothergillian Prize of the Medical Society of London for an essay on "Croup and Diphtheria."

From 1859 to 1874, Crisp conducted an acrimonious attack upon the President and Council of the Royal College of Surgeons of Ireland, relating to the award of the Carmichael Prize for which he had also been an unsuccessful candidate. He wrote and published open letters to the Presidents of the Royal Colleges of England and of Ireland, to the President of the General Medical Council, the *Lancet*, and other medical journals. In this case, his exposure of the abuse of the regulations and of injustices in the awards seems to have had very substantial grounds indeed, and probably the very gravity of his charges ensured the official oblivion in which the matter was ultimately sunk. He gained nothing by the controversy save the ill will of certain of his fellows and the satisfaction that he had exposed to the light of day some very dubious dealings by those responsible for the administration of the regulations relating to the prize.

In 1846, Crisp had married and after some years the increasing expenditure attendant upon a growing family determined him once again to devote himself to general practice and this he resumed in Beaufort Street, Chelsea, where he lived for the last twenty years of his life. Throughout this period, even while he was engaged in the wordy warfare against the Colleges and corporate bodies, he was no less active in his researches into clinical problems and interesting features of comparative anatomy. At his house in Chelsea he had a museum containing some five thousand specimens prepared by himself. Between the years 1846 and 1880 more than a hundred and twenty papers written by him were published in the *Transactions of the Pathological Society of London,* of which Society he was Vice-President from 1870 to 1872. In addition to these activities, he investigated the causes of death of animals in the Gardens of the Zoological Society of London, and over forty of his papers appeared in the *Proceedings* of the Society. His relations with this Society seem to have been entirely harmonious throughout. He was a Fellow for twenty years, and special facilities were granted to him to carry out his investigations on the premises.

Crisp died on 15 November 1882, whilst on a visit to a patient, and of him as a man it seems impossible to gain any more intimate details than those provided by the anonymous author of his rather grudging obituary notice published in the *Lancet* (9 December 1882). This notice begins with the somewhat ungenerous statement that "with the death of the subject of this memoir a striking if not very imposing figure disappears from the stage of medicine." Physically, the author says that the subject of his notice was "a short and strongly-built, active man, with a massive bald head, a handsome face, a genial smile and a pleasant musical voice." Concerning his character, we learn from this account that "he was a ready, self-reliant speaker, always prompt to attack, but ever ready to acknowledge his own mistakes. He was a warm friend and (excepting towards the Colleges) a generous enemy." He was "a man of indomitable courage, self-reliance, and energy, of unimpeachable integrity and utter unselfishness." Surely, little more could be said in praise of any man's character, but to this must be added his own admission—"policy is not a word in my vocabulary." As the writer of the obituary notice in the *British Medical Journal* (25 November 1882) says, "With somewhat more of moderation and discrete consideration for the conditions under which reforms

could be effected, he would probably have made a greater impression on the strongholds which he assailed."

That Crisp was an outstanding figure in his own time is not to be denied: but that he was one who, by very reason of his "unimpeachable integrity" and his avowed disregard of policy, was not acceptable to his contemporaries is beyond doubt. The question therefore arises as to whether this man to whom so many injustices seem to have been done during his lifetime has not also suffered still further injustice after his death. On the whole the answer seems to be unequivocal. Crisp's contributions to scientific knowledge place him in a rank to which no posthumous estimation has so far elevated him. This brief account of his life and work is written in the hope that the future may accord more credit to the man who, with boundless energy and a true Hunterian spirit, devoted himself with considerable success to the elucidation of some of the outstanding problems of comparative anatomy and clinical medicine.

The Bibliography* of Edwards Crisp

1834-1835

On scabies. *Lancet*, *1*, 810.

1835-1836

A case of deranged circulation. *Lancet*, *1*, 534.

A case of malformed fingers. *Ibid.*, *2*, 62.

On penny medical clubs. *Ibid.*, *2*, 562, 877.

Note announcing the rejection by the practitioners of Camberwell of the recommendation of the poor-law commissioners for the formation of medical clubs. *Lond. med. Gaz.*, *18*, 960.

Names of the gentlemen who attended the meeting. *Ibid.*, *18*, 988.

1836-1837

Medical Club scheme at Camberwell. *Lancet*, *1*, 31.

Impervious colon. Obstruction of the cystic duct. Examination of a body 24 hours after death. *Ibid.*, *2*, 769.

1838-1839

Note re spinal affections. *Lancet*, *1*, 776.

1839-1840

Cases of cerebral disease. *Lancet*, *1*, 863.

1840-1841

On dry gangrene. *Lancet*, *2*, 245.

1842-1843

On the treatment of idiopathic gangrene. *Lancet*, *1*, 207.

Cases of perforation of the stomach from simple ulceration. *Ibid.*, *2*, 639.

1843-1844

On neglect of facts in pathology. *Lancet*, *1*, 405.

1844

On prussic acid. *Lancet*, *1*, 751.

On puerperal convulsions and albuminous urine. *Ibid.*, *2*, 371.

The anatomical structure and diseases of the larger blood vessels. Jacksonian Prize Essay. London, Royal College of Surgeons Library, 115 MS. pp.

1846

On melaena. *Lancet*, *1*, 155.

On a case of rupture of the left ventricle of the heart; On a case of omental hernia. *Lond. med. Gaz.*, *38*, 857.

1847

A treatise on the structure, disease, and injuries of the blood vessels. London, John Churchill, 354 pp. (German translation: Berlin, A. Förstner, 1848.)

* In those instances where items have no clear-cut title, the citation used in the journal index has been copied.

On infantile pleuritis. *Lancet, 1,* 65.

On malformation of the heart with absence of pulmonary artery. *Ibid., 2,* 410.

On intestinal obstructions. *Ibid., 2,* 557.

Case of malformation of the heart. *Lond. med. Gaz., 39,* 693.

Note from Dr. Crisp re review of his essay on the structure, diseases and injuries of the blood vessels. *Ibid., 40,* 437.

1846-1848

Malformation of the heart. *Trans. path. Soc. Lond. 1,* 49.

Rupture of the heart from disease. *Ibid.,* 62.

Diseased heart and aorta. *Ibid.,* 64.

Disease of the coronary arteries: angina pectoris. *Ibid., 1,* 65.

Strangulated femoral hernia. *Ibid.,* 99.

Polypus of the uterus. *Ibid.,* 295.

The testicle of a ram converted into calcareous matter. An encysted tumour, the size of a walnut, attached to the fundus of the bladder of a sheep. A hard scirrhous tumour, from the right pectoral muscle of a canary. A fungoid tumour from the eye of a canary. A fungoid tumour of six months' growth, removed by Mr. Langstaff from the chest of a dog. A tumour removed from the breast of a terrier bitch. *Ibid.,* 346.

1849

The examination of a rejected candidate at the Royal College of Physicians of London, Dec. 21, 1848. London, J. Churchill. 62 pp.

Examination of the President and Examiners of the Royal College of Physicians of London. London, E. Wilson. 57 pp.

The examination at the College of Physicians. *Lancet, 1,* 327.

1851

The causes, diagnosis and treatment of obstruction of the intestines within the abdomen. Jacksonian Prize Essay. London, Royal College of Surgeons Library. 74 MS. pp.

On the legal right to practise as a physician in England. *Lancet, 2,* 426.

Hunterian Oration that would have been delivered by a member of the College of Surgeons of London, if permission had been granted to him by the President and Council. *Lond. med. Examiner,* 1.

Malignant cholera. *Ibid.,* 4.

On spontaneous rupture of Falloppian and ovarian cysts. *Ibid.,* 37.

An essay on croup, with statistical deductions. *Ibid.,* 55, 88, 101.

The histories of the Colleges of Phyicians, Surgeons and Apothecaries. *Ibid.,* 65, 93.

Multum in parvo: a practical abstract of the British and foreign journals. *Ibid.,* 65, 72, 233, 250.

On intestinal worms. *Ibid.,* 129.

On the causes of instant death. *Ibid.,* 154.

Sketches of the medical schools of London, Dublin, Edinburgh and Paris. *Ibid.,* 202, 225.

On the statistics of the rupture of Falloppian and ovarian cysts. *Ibid.,* 244.

The history of the Hunterian Museum. *Ibid.,* 237.

A case of disease of the aortic valves. *Lond. med. Gaz., 46,* 606.

1852

Appendix to the treatise on the structure and diseases of the blood vessels. *Lond. med. Examiner,* 358.

On the causes of sudden death. *Ibid.,* 9.

Multum in parvo: a practical abstract of the British and foreign journals. *Ibid.,* 22, 27, 82, 121, 132, 170, 215, 244.

A lecture on the advantages of the study of natural history. *Ibid.,* 33.

On the beneficial influence of tar in the treatment of some cutaneous diseases and on the supposed injurious effects of arsenic upon the constitution when long continued. *Ibid.,* 77.

On intestinal obstructions and on the propriety of the abdominal section in some cases. *Ibid.,* 105.

On the abandonment of general bleeding in the modern practice of physic in England and its injurious results. *Ibid.,* 162, 189.

A practical abstract of the medical and surgical journals of the 18th century. *Ibid.,* 170.

Abstract of the Philosophical Transactions. *Ibid.,* 172, 207, 255.

On the morbid conditions of the bile and gall bladder. *Ibid.,* 221.

On perforations of the stomach from malignant and non-malignant ulceration, with their causes, pathology and treatment. *Ibid.,* 269.

On discoloration of the hair. *Lancet, 1,* 203.

On twist and adhesion of the umbilical cord. *Ibid.,* 203.

On the serre fine. *Ibid.,* 248.

Specimens of perforation of the stomach. *Ibid.,* 432.

1852-1853

Tubercle in the lungs and spleen with fatty liver. *Trans. path. Soc. Lond., 4,* 42.

Calcareous concretions of the peritoneum. *Ibid.,* 164.

Malformations of the umbilical cord. *Ibid.,* 241.

1853

The extra-licentiates of the Royal College of Physicians. *Med. Times, 1,* 66.

A dog without a spleen. *Ibid., 2,* 542.

The weight and form of the heart, the diameter of the aorta and the size of the blood corpuscles in the vertebrata. *Ibid.,* 542.

On the anatomy of the cuckoo. *Proc. Zool. Soc., 21,* 67.

On two species of Entozoa. *Ibid.,* 68.

On the splenic vein of the giraffe. *Ibid.,* 99.

On discoloration of hair. *Lancet, 1,* 502.

The New Charter: College of Physicians. *Ibid.,* 429.

On the Medical Reform Bill. *Ibid.,* 349.

On the recorded cases of death from chloroform. *Ibid.,* 523.

On tape worm. *Ibid.,* 547.

On arrest of development in the foetus. *Ibid., 2,* 502.

On the weight and form of the heart. *Ibid.,* 486.

Taenia and its remedies. *Assoc. med. J.,* 513.

Abnormal placenta. *Ibid.,* 904.

Valves in splenic veins. *Ibid.,* 905.

Colouring matter of bile. *Ibid.,* 1114.

1853-1854

Filaria in the heart of a peregrine falcon. *Trans. path. Soc. Lond. 5,* 345.

Cysterci and tricocephali from an alligator (*C. lucius*). *Ibid.,* 346.

Scirrhous kidney of a Capybara (*C. hydrochoerus*). *Ibid.,* 347.

Large fungoid tumour in a carp. *Ibid.,* 347.

Malignant tumour on the pectoral muscle of a mouse. (*M. musculus*). *Ibid.,* 348.

1854

Valves in splenic veins. *Assoc. med. J.,* 41.

Structure of arteries. *Ibid.,* 225.

Tubercular peritonitis in an antelope. *Ibid.,* 227.

Deposits of fat in lower animals. *Ibid.,* 318.

Thoracic aneurism in a monkey. *Ibid.,* 319.

Glanders in the cat tribe. *Ibid.,* 319.

Dissection of an elephant. *Ibid.,* 341.

Case of gallstones. *Ibid.,* 626.

On the spleen in saurian and chelonian reptiles. *Ibid.,* 1079.

Valves in the splenic vein. *Lancet, 1,* 83.

Malpighian corpuscles of the spleen, shown by the application of heat and nitric acid. *Ibid.,* 83.

The aorta of the elephant. *Ibid.,* 198.

Tubercular peritonitis in an antelope. *Ibid.,* 255.

On the deposit of fat in certain conditions of the bodies of the lower animals. *Ibid.,* 306.

Aneurism in the thoracic aorta of a monkey. *Ibid.,* 337.

Malignant blood disease in feline animals. *Ibid.,* 337.

The anatomy and physiology of the elephant. *Ibid.,* 448.

Valves in the splenic vein of the kangaroo. *Ibid.* 448.

On cholera blood. *Ibid., 2,* 355.

On the Malpighian bodies of the spleen of the alligator and crocodile. *Ibid.,* 442.

1855

A treatise on the structure and use of the spleen. London, The Author. xii, 198 pp.

On the relative weight of the body and of the viscera of the elephant. *Proc. Zool. Soc., 23,* 186.

On some points relating to the anatomy of the Tasmanian wolf (*Thylacinus cynocephalus*) and of the Cape hunting dog (*Lycaon pictus*). *Ibid.,* 188.

The oesophagus of the crocodile. *Lancet, 1,* 91.

Arrest of development of the tadpole of the frog. *Ibid.,* 91.

On the cause of alteration of the voice of the "singing mouse." *Ibid.,* 92.

Fungus haematodes of the heart and spleen. *Ibid.,* 215.

Letter, enclosing extract from Lord Palmerston's speech, respecting the profession. *Ibid.,* 230.

Valves in the splenic and gastric veins of a large mastiff. *Ibid.,* 242.

Prevention of gangrene from cold. *Ibid., 2,* 534.

Larvae of the common frog and water-newt. *Assoc. med. J.,* 88.

Valves in coronary and splenic veins of a mastiff. Mollitis ossium in a monkey. Skull and brain of an armadillo. *Ibid.,* 187.

Fungus haematodes of the spleen and heart. *Ibid.,* 189.

On the heart of reptiles. *Ibid.,* 322.

1855-1856

Fibrinous casts of the bronchial tubes. *Trans. path. Soc. Lond., 7,* 56.

Lithic acid calculus removed by dilatation from the female bladder. *Ibid.,* 260.

1856

Observations on *Strongylus filaria* and *Botaurus stellaris. Proc. zool. Soc., 24,* 53.

On the viscera of *Esox lucius. Ibid.,* 106.

Remarks on *Mus musculus. Ibid.,* 106.

On the head and brain of a monoculous lamb. *Ibid.,* 149.

On filamentous entozoa (so-called). *Lancet, 1,* 82.

On operations of the shoulder joint. *Ibid.,* 218.

1857

On the presence or absence of air in the bones of birds. *Proc. zool. Soc., 25,* 9, 215.

Exhibition of a nest believed to be that of the great grey shrike (*Lanius excubitor*). *Ibid.,* 219.

Plugging of the superior longitudinal sinus and cerebral veins. *Trans. path. Soc. Lond., 10,* 117.

Ulceration of the appendix vermiformis. *Ibid.,* 151.

Specimens of coagulated blood in lower animals. *Ibid.,* 337.

1859

Exhibition of a hen that had assumed the plumage of the cock. *Proc. zool. Soc., 27,* 127.

Ocurrence of a bantam hen sitting upon the eggs of a water ouzel (*Cinclus aquaticus*) and hatching and rearing a young bird. *Ibid.,* 200.

1859-1860

Tubercular peritonitis; softening of the brain. *Trans. path. Soc. Lond. 11.* 107.

A monoculous lamb which has recently been dissected. *Ibid.,* 305.

Hydatids in an old Honduras turkey. *Ibid.,* 306.

Enlarged spleen in a hare. *Ibid.,* 307.

Four gallstones from the gall bladder of a spotted cavy (*Coelogenys paca*). *Ibid.,* 307.

Pericarditis in birds. *Ibid.,* 307.

1860

On the causes of death in many animals at the Zoo. *Proc. zool. Soc., 28,* 175, 190.

Exhibition of the cock of the rock (*Rupicola crocea*) which has been brought alive to and died in this country. *Ibid.,* 98.

Exhibition and drawings of *Coenurus cerebralis* from the brain of the common sheep. *Ibid.,* 185.

Note on the blood corpuscles of the Japanese gigantic salamander (*Sieboldia maxima*). *Ibid.,* 203.

On the structure, relative size and use of the tail-glands in birds. *Ibid.,* 254.

On the benefits likely to accrue from the formation of an Agricultural Museum in London. *Lancet, 2,* 241.

Villous cancer (so-called) of the intestine. *Trans. path. Soc. Lond., 12,* 113.

Poisoning by nitric acid. *Ibid.,* 114.

1861

On some points relating to the habits and anatomy of the oceanic and of the freshwater ducks and also of the hare (*Lepus timidus*) and of the rabbit (*L. cuniculus*) in relation to the question of hybridism. *Proc. zool. Soc.,* 82.

Exhibition of drawings of two fishes from a saltwater lagoon near Cape Coast Castle, West Africa. *Ibid.,* 87.

The conservatorship of the Hunterian Museum. *Lancet, 2,* 558.

1861-1862

Atheromatous aorta, incipient aneurism and cancerous disease. *Trans. path. Soc. Lond., 13,* 55.

Ulceration and perforation of the stomach. *Ibid.,* 93.

Scirrhous enlargement of the pancreas. *Ibid.,* 124.

Tubercle of the spleen, liver and lungs of an Entellus monkey (*Semnopithecus entellus*). *Ibid.,* 269.

Enlarged renal bodies in a flamingo. *Ibid.,* 271.

Alteration in size and structure of the suprarenal capsules. *Ibid.,* 248.

1862

The Carmichael and Collegiate Prizes. London, H. Teape & Son. 8 pp.

The diagnosis of pancreatic disease. *Lancet, II,* 708.

On the situation, form and capacity of the gall bladder in the vertebrata. On its absence in certain animals and on the colour of the bile. *Proc. zool. Soc.,* 132.

Exhibition of a head of a partridge (*Perdix cinerea*) with deformed upper mandible. Of the caecal appendages of the Impeyan pheasant and the tail glands of the black swan (*Cygnus atratus*) and of the red-throated diver (*Colymbus septentrionalis*). *Ibid.,* 141.

On some points relating to the anatomy of the humming bird (*Trochilus colibris*). *Ibid.*, 208.

On the capacity of the oesophagus and other parts of the intestinal canal of *Python reticulatus*. *Ibid.*, 210.

On the probable cause of death of a wart hog (*Phacochoerus aethiopicus*). *Ibid.*, 212.

Exhibition of the enlarged tail-glands of two domestic hens. *Ibid.*, 219.

1862-1863

A nodulated, long concretion from the stofle joint (knee) of a horse. *Trans. path. Soc. Lond.*, *14*, 288.

The crop of a turkey enormously distended from an accumulation of dry, tough grass which the bird was unable to get rid of. *Ibid.*, 288.

The tuberculated spleen of two pigs. *Ibid.*, 288.

Fungoid disease from the orbit of a sheep. *Ibid.*, 288.

A large oblong bronchial gland of an ox, situated at the bifurcation of the trachea. *Ibid.*, 289.

Cysts from the abdomens of dogs. *Ibid.*, 289.

Pericarditis in a young emu. *Ibid.*, 289.

The gad of a Stanley crane (*A. paradisia*). *Ibid.*, 289.

1863

The meat pie. *Lancet*, *1*, 48.

The Carmichael and Harley Prizes. *Ibid.*, *2*, 172.

The Triennial College Prize on the suprarenal capsules. *Ibid.*, 577.

On the Carmichael and Harley Prizes. *Med. Times*, *2*, 158.

Correspondence with the Medical Council. *Brit. med. J. II*, 227.

1863-1864

Gallstones. *Trans. path. Soc. Lond.*, *15*, 134.

A portion of the spleen of a bull that died of splenic apoplexy. *Ibid.*, 255.

Dried tubercles from the liver of a Stanley crane (*A. paradisia*). *Ibid.*, 256.

The bladder of a horse, with a urinary calculus twenty pounds. *Ibid.*, 256.

Tuberculated spleen of a boar. *Ibid.*, 256.

The ova of the *Oxyuris vermicularis* and the lungs of a lamb with the bronchial tubes filled with *Strongylus filaria*, with microscopical specimens. *Ibid.*, 259.

Enlarged thyroid glands in young lions. *Ibid.*, 260.

Sphacelus of the tongue and cheeks of a chimpanzee (*Pithecus troglodytes*), fatty liver and a lumbricus in the duodenum. *Ibid.*, 260.

1864

On the visceral anatomy of the screamer (*Chauna chavaria*). *Proc. zool. Soc.*, 14.

On *Filaria gracilis* in a monkey. *Ibid.*, 16.

On some parts of the anatomy of the porpoise. *Ibid.*, 17.

Contributions to the anatomy of the giraffe, with an account of the length of the alimentary canal in many of the ruminants, as measured by the author. *Ibid.*, 63.

Exhibition of some drawings representing the eggs and young of the Anaconda (*Eunectes murinus*). *Ibid.*, 68.

Contributions to the anatomy of the eland. *Ibid.*, 98. (Paper delivered but not published.)

Exhibition of a wax cast of the tongue, larynx, trachea, heart and lungs, and thyroid gland of a young lion at birth. *Ibid.*, 158.

Exhibition of an ear of barley. *Ibid.*, 159.

On the change of colour in the common trout (*Salmo fario*). *Ibid.*, 166.

Further contributions to the anatomy of the giraffe and the nylghau. *Ibid.*, 269.

Valves in abdominal veins. *Brit. med. J.*, *2*, 426.

On the presence of valves in the abdominal veins. *Med. Times*, *2*, 336.

On the size of the blood corpuscles in relation to the size of the animal, its organisation and powers of endurance. *Ibid.*, 336.

1864-1865

Poisoning by butter (chloride) of antimony. *Trans. path. Soc. Lond.*, *16*, 125.

Stomach, duodenum and jejunum of a fat man weighing about eighteen stone. *Ibid.*, 130.

Tuberculous lungs of an antelope (*Rietboc; Eleotragus arundinaceus*). *Ibid.*, 279.

Tubercle of the spleen of a young orang (*Simia satyrus*). *Ibid.*, 280.

Morbid specimens (casts in wax, etc.) of various forms of tubercle in the lower animals. *Ibid.*, 280.

Diseased crania of the quadrumana. *Ibid.*, 281.

Diseased renal bodies in a camel. *Ibid.*, 282.

1865

On the os penis of the chimpanzee (*Troglodytes niger*) and of the orang (*Simia satyrus*). *Proc. zool. Soc.*, 48.

On some points relating to the anatomy of the Bactrian camel (*Camelus bactrianus*)

and on the presence of intestinal glands not before noticed. *Ibid.*, 257.

On the anatomy and habits of the water ouzel (*Cinclus aquaticus*). *Ibid.*, 49.

Exhibition of a drawing of the placenta of the giraffe, lately obtained from the Society's Gardens. *Ibid.*, 328.

Exhibition of a drawing of the aardvaak (*Orycteropus capensis*). *Ibid.*, 328.

Pathology of cattle plague. *Brit. med. J.*, 484.

Inflammation of the epiglottis. *Ibid.*, 485.

Exanthematous nature of cattle plague. *Ibid.*, 664.

On the relative weight of the brain in relation to the intelligence in the vertebrata. *Med. Times*, 2, 373.

On the head and brain of the orang (*S. satyrus*). *Ibid.*, 511.

On the pathology of the cattle plague. *Ibid.*, 455.

On sheep plague. *Ibid.*, 669.

On the relative weight of the brain and outward form of this organ in relation to the intelligence of the animal. Pamphlet. London.

1865-1866

Acute inflammation of the epiglottis. *Trans. path. Soc. Lond.*, 17, 28.

Preparations exhibiting the various stages of cattle plague. *Ibid.*, 447.

Specimens of the cattle plague, so-called, in sheep. *Ibid.*, 449.

Pathology of cattle plague in relation to smallpox. *Ibid.*, 454.

1866

On diseases in lambs and the cattle plague. Truro, Ward and Sons. 12 pp.

Transfusion of blood in cattle plague. *Lancet*, 1, 704.

Further observations relating to the anatomy of the giraffe. *Proc. zool. Soc.*, 563.

Transfusion of blood in cattle plague. *Brit. med. J.*, 1, 686.

On malignant cholera, its origin, pathology, treatment and mode of prevention. London, R. Hardwicke. viii, 135 pp.

Dogs and disinfectants. *Med. Times*, 1, 188.

1866-1867

A blighted foetus which produced obstruction to the passage of a living child at full period of gestation. *Trans. path. Soc. Lond.*, 18, 272.

Smallpox in sheep. *Ibid.*, 288.

Obstructions in the alimentary tube of several animals from accumulations of hay and straw. *Ibid.*, 299.

A large encephaloid tumour from the chest of a lamb. *Ibid.*, 300.

The lower part of the leg of a horse, showing rupture of the flexor tendon six years after "nerving." *Ibid.*, 302.

1867

Purpuric fever. *Lancet*, 1, 773.

On some points connected with the anatomy of the hippopotamus. *Proc. zool. Soc.*, 601.

On the form, size and structure of the viscera of the hippopotamus, as compared with the same parts in the members of the pachyderm family, and in some other animals. *Ibid.*, 689.

1867-1868

Specimens showing the effect of purulent inoculations in the guinea-pig. *Ibid.*, 459.

Stomachs of wild rabbits, containing *Strongylus retortiformis* and the livers affected with (so-called) false tubercle. *Ibid.*, 459.

Specimens of false tubercle (so-called) in the lungs of sheep. *Ibid.*, 460.

Specimens showing the origin of the so-called false tubercle in the wild rabbit. *Ibid.*, 470.

Specimens showing the origin of tubercle in the lower animals and microscopic appearance of the blood. *Ibid.*, 472.

Intestines from the so-called typhoid fever of pigs. *Ibid.*, 473.

1868

The Carmichael Prizes. *Lancet*, 2, 103, 139, 238.

Phthisis and the British Association. *Lancet*, 2, 468.

Letter to the Medical Council re the Carmichael Prize. *Med. Times*, 2, 78.

The intestinal canal of a gorilla. *Ibid.*, 277.

On the eyes of vertebrata. *Ibid.*, 278.

On the viscera of Thylacinus. *Ibid.*, 278.

On a new fossil whale. *Ibid.*, 278.

On statistics of phthisis in England. *Ibid.*, 279.

1868-1869

Apoplexy of the cerebellum. *Trans. path. Soc. Lond.*, 20, 1.

Incipient aneurism with ossific deposit in the sac. *Ibid.*, 142.

Enlarged kidneys. *Ibid.*, 224.

Tubercle in the common fowl from a damp atmosphere. *Ibid.*, 441.

Echinococcous cysts from various animals. *Ibid.*, 444.

1869

The Carmichael Prize. Mottoes and envelopes. *Med. Times*, 2, 269.

1869-1870

Large serous effusion into the ventricles of the brain with inflammatory tubercle in the fourth ventricle. *Trans. path. Soc. Lond.*, 21, 9.

Abscess of the kidney. *Ibid.*, 257.

Urinary calculi in the lower animals. *Ibid.*, 424.

Inflamed and congested condition of the ova and oviduct in the common fowl. *Ibid.*, 429.

Calculus from the cloaca of a brown pelican. *Ibid.*, 430.

On fatty degeneration in the lower animals. *Ibid.*, 431.

1870

The meeting at the College of Surgeons. *Lancet*, 1, 507.

On the Medical Reform Union. *Med. Times*, 1, 539.

On loss of hair. *Ibid.*, 2, 518.

On medical reform. London, 52 pp.

Summary of Dr. Crisp's Carmichael essay on medical reform and medical education, 1867. London, 8 pp.

1870-1871

Aneurism of the coronary artery. *Trans. path. Soc. Lond.*, 22, 106.

Cancer of the tongue and simple stricture of the oesophagus. *Ibid.*, 128.

Fatal haemorrhage from simple ulcer of the stomach. *Ibid.*, 141.

General alopecia with microscopical specimens of the hair and nails. *Ibid.*, 305.

Specimens of cataract and opacities of the cornea in the lower animals. *Ibid.*, 350.

1871

Smallpox and its prevention, with a record of experiments upon the lower animals. *Lancet*, 1, 448.

Inflammatory croup. Cancer of the oesophagus. Ulcer of the stomach. Aneurism of the coronary artery. Diseases of the eye in lower animals. *Brit. med. J.*, 1, 120, 281, 450, 651.

Smallpox and its prevention. *Med. Times*, 1, 294.

1871-1872

Inflammatory softening of the cerebellum. *Trans. path. Soc. Lond.*, 23, 26.

Abscesses in the left wall of the heart in pyaemia. *Ibid.*, 87.

Fatal strangulation from the twisting of a portion of the colon. *Ibid.*, 112.

Intussusception in an infant. *Ibid.*, 125.

Incipient cirrhosis of the liver and baggy stomach. *Ibid.*, 137.

Diseased hip joint, with albuminuria. *Ibid.*, 178.

On tubercle in the common fowl after vaccination. *Ibid.*, 312.

1872

The geography of pulmonary consumption. *Brit. med. J.*, 2, 428.

Letter re the reports of the Medical Society of London. *Lancet*, 2, 766.

1872-1873

Heart clot and sudden death. *Trans. path. Soc. Lond.*, 24, 46.

Diseased livers and kidneys from the inordinate use of alcohol. *Ibid.*, 265.

Tumour in the chest of an Andalusian pig, with pericarditis. *Ibid.*, 271.

Specimens of *Synagmus trachealis* from the trachea of chickens. *Ibid.*, 272.

Gordius in the lungs of sheep. *Ibid.*, 276.

Remarks in the discussion on the anatomical relations of pulmonary phthisis to tubercle. *Ibid.*, 346.

1873-1874

Imperforate rectum. *Trans. path. Soc. Lond.*, 25, 114.

Oesophageal obstruction in a cock. *Ibid.*, 276.

Traumatic aneurism in the common fowl. *Ibid.*, 277.

Specimens of the disease in the South of Ireland amongst poultry. *Ibid.*, 280.

Diphtheria-like membrane in dove-house pigeons. *Ibid.*, 282.

On grouse disease. *Ibid.*, 283.

Remarks in the discussion on cancer. *Ibid.*, 356.

1874

On cancer. *Brit. med. J.*, 1, 486.

On cancer. *Lancet*, 1, 515.

The Carmichael Prizes. *Ibid.*, 2, 69.

Note on Dr. Lankester. *Med. Times*, 2, 595.

1874-1875

Pleuro-pneumonia. Haemoptysis eighteen months before death. A puckered cavity near to the apex of the lung filled with bony deposit. *Trans. path. Soc. Lond.*, 26, 14.

Pericarditis; pus in pericardium. *Ibid.*, 67.

Colloid cancer of the omentum. *Ibid.*, 123.

Tubercle in twenty-one pheasants. *Ibid.*, 249.

Two examples of tumours in the common fowl. *Ibid.*, 251.

Torticollis in the common fowl. *Ibid.*, 252.

Remarks in the discussion on the germ theory of disease. *Ibid.*, 303.

1875

On the germ theory of disease. *Lancet, 1,* 576.

The late Dr. Lankester. *Brit. med. J., 2,* 666.

Medical degrees and titles. *Ibid.*, 368.

The germ theory of disease. *Ibid.*, 558.

1875-1876

Meningitis. *Trans. path. Soc. Lond., 27,* 28.

Fatty tumour from the pectoral muscle of a hen. *Ibid.*, 339.

Rickets in young pheasants. *Ibid.*, 339.

Fractured humerus of a gorilla. *Ibid.*, 340.

1876-1877

Fibroid ovarian tumour. *Trans. path. Soc. Lond., 28,* 195.

Calculous deposit in the urethra of oxen, producing rupture of the bladder. *Ibid.*, 453.

A double duck's egg. *Ibid.*, 454.

Pneumonia in birds. *Ibid.*, 455.

1877

Vaccination. *Brit. med. J., 1,* 89.

On Government smallpox hospitals. *Med. Times, 1,* 103.

1877-1878

Miliary tubercle of the lungs in an infant aged three months. *Trans. path. Soc. Lond., 29,* 34.

Imperforate anus. *Ibid.*, 115.

1878-1879

Rabies of the dog. *Trans. path. Soc. Lond., 30,* 584.

1880-1881

Remarks in the discussion on rickets. *Trans. path. Soc. Lond., 32,* 330.

1880

Animal vaccination. *Brit. med. J., 1,* 63.

"Medical Euthanasia"

A Paper, Published in Latin in 1826, Translated and Reintroduced to the Medical Profession

WALTER CANE*

WHEN within the recent past the public's interest in "mercy killing" was aroused by a number of sensational court trials, the Nassau County Medical Society was asked on several occasions to supply a speaker on this controversial subject. After the choice fell on me, I tried to familiarize myself with the material available and to do a little research of my own. It soon became apparent that the present-day use of the term "euthanasia" as meaning mercy killing is an historical misnomer. The word euthanasia was known to, and used by, Emperor Augustus nearly two thousand years ago, and until the end of the nineteenth century it was understood to mean the act of dying peacefully and the medical art of accomplishing this. That no thought had been given to killing the patient can be seen from the treatise that follows. In it the author, as if he lived in our midst, warns his colleagues and students against any rash act, even if a sense of mercy begins to prevail over the sense of duty in any particular case.

As far as could be determined, the Roman historian Suetonius is the first writer in history using the word euthanasia. The philosopher Bacon called upon the medical profession to administer euthanasia to the dying. In 1794, a physician by the name of Paradys called attention anew to its importance.[1] Thereafter Reil, Marx (the writer of this treatise), and Rohlfs elaborated on the subject. Rohlfs, in 1880, called Marx' "Euthanasia" a medical classic, worthy to be on the bookshelf of the educated physician for many a century to come. Rohlfs[2] called the art of euthanasia "obstetrics of the soul," and he gave it the rank of an independent medical discipline in line with diagnosis, therapy, surgery, and obstetrics.

Marx wrote his thesis for oral delivery in 1826 at the ceremonies of his installation as an assistant professor of medicine at the German university of Goettingen, at that time part of the inde-

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1 Paradys. *Oratio de euthanasia.* Leyden, 1794.

2 Rohlfs. *Geschichte der deutschen Medizin.* Stuttgart, 1880.

pendent kingdom of Hanover. The thesis was written in Latin, then the language of medical writing and teaching. It gave me many an evening of pleasant entertainment to translate it into English. Authenticity of translation is vouched for; the original punctuation has been largely preserved. Some sentences are too long to make for good reading but this was the style of the time and to break them up in order to adapt them to modern English would have made this translation open to criticism as to its authenticity. The quotation from Bacon was not translated; it appears in its original wording, taken from Spedding and Ellis' 1883 edition of Bacon's works. The quotation from the Book of Job is slightly at variance with the text in our English Bible. Marx used the text in the German Bible and translated it into Latin. It makes for a more fitting ending than our English text would have done.

Progress in the science of medicine cannot be made more evident than by an occasional glance into the past. The art of medicine, however, has remained unchanged, including the art of euthanasia in the true and historical sense of the word. But the term "euthanasia," meaning the care of the dying, has been crowded out of its rightful existence by the advocates of mercy killing. What euthanasia really was and how it was taught, is hereby preserved for the medical profession.

W. C.

ACKNOWLEDGMENT

Grateful acknowledgment is herewith made to the Armed Forces Medical Library in Washington, D. C., for supplying me with a photo print of the original, to my knowledge the only one in existence in this hemisphere. My appreciation goes also to Dr. Louis H. Bauer, President of the American Medical Association, to Dr. John Cranford Adams, President of Hofstra College, to Dr. Everett Colgate Jessup and to Dr. Franklin Weimer Fry, for their valuable help in my effort to make this translation not only correct but readable as well.

MEDICAL EUTHANASIA

THESIS BY DR. CARL FRIEDRICH HEINRICH MARX,
PUBLISHED IN 1826, BY DIETERICH, GOETTINGEN, GERMANY

As often as Caesar Augustus heard that someone had died quickly and without suffering, he prayed for euthanasia, using this very word, for himself and for his family.[3]

Birth and death—between these two points revolves the great drama of life. From the first moment of birth onward, the hour hand inclines continuously toward sunset. "Every day a certain fraction of our life is taken away, and even while we grow life declines."[4] Even the need for food, for rest, and for sleep reminds us no less of our destiny than the young person stricken with disease in his prime or the old man weakened by languor whose limbs deny him further service. It is man's lot to die, this is the cry of horror; nor will he who looks for a reason find an answer satisfying his searching mind wherever he may turn. "A theory cannot be offered as to why man has to die by force of nature."[5] Many, not content with this verdict, have toiled in various ways to find a remedy enabling them to resist the damaging effect of aging. But no matter how much they exerted themselves in search for it, Medea's Potion, that Universal Medicine, the Stone of the Philosophers, has not been found, nor will it ever be found. Man's dreams and visions will be destroyed by daylight, and Nature's final verdict will sound: Be Mindful of Your Death.

Now, however, unless external force strikes or is applied, this final decline of life will not take place so suddenly that we are not able to tell several particular, intermediary stages. For while death appears in a two-fold manner, either by cessation of all strength and by exhaustion of all vitality throughout the bodily structure (called death of old age or natural), or by slow or sudden destruction of one or another indispensable organ (called death from disease), still either way it usually proceeds by the same changes, the same signs. Man, in complete control and awareness of himself, gradually disintegrates into that stage of subconsciousness where only the particular bodily systems follow autonomously their inveterate modes of action; until finally, bare of the faculty of perception, his parts deadened to all stimulants, he consists of just a framework without motility. Man dies in stages. At first the senses disappear, delirium and somnolence take the place of the intellect,

3 Suetonius. *The lives of the twelve Caesars,* Book II.

4 Seneca. *Letters to Lucilius,* XXIV.

5 Stahl. *Theoria de medicina,* Vol. II, Pathologia, p. 20.

blood circulation and with it heat generation decline, voluntary and involuntary musculature languishes, and finally respiration, circulation, and intestinal peristalsis come to a stop. Just as pecu-

Marx (C. F. H.)

DE EUTHANASIA MEDICA

PROLUSIO,

QUA

AD ORATIONEM,

QUAM AD AUSPICANDUM PROFESSORIS MUNUS EXTRA ORDINEM
INDULGENTISSIME SIBI CONCESSUM

DIE XXIX. JULII MDCCCXXVI. PUBLICE HABEBIT,

RITE INVITAT

C. F. H. MARX

MED. ET CHIR. Dr.

GOTTINGAE,
TYPIS DIETERICHIANIS EXPRESSUM.

liar as it is that old people's taste for good food remains their strongest link with the blessings of this earth, just as peculiar is it to the dying that the sense of hearing leaves them last of all.

Since death, which cannot be exorcised by any means, does not befall us in one assault but proceeds gradually and by certain steps, one following the other, it may be asked what can be done so

the passing from life may be gentle and bearable. Why should not man, with his intellect mastering so many problems, find and produce some skilful contrivance for the care of the dying? Indeed the philosophers and the priests have much to offer, both in teaching and in comforting, with which to remove fear of future death from the living and to stretch out and to strengthen hope for a life beyond to the dying; the physician, on the other hand, who is present at the greatest peril to, and crisis of, life is the best judge as to when illness turns for the worse, and he is a continuous observer of his patient's ailment. He is not expected to have a remedy for death but for skilful alleviation of suffering, and he should know how to apply it where any hope has departed. This is that science, called euthanasia, which checks oppressing features of illness, relieves pain, and renders the supreme and inescapable hour a most peaceful one. To this aim our greatest efforts should be devoted, as was urged by that great Englishman who said:

> Again, to go a little further; I esteem it likewise to be clearly the office of a physician, not only to restore health, but also to mitigate the pains and torments of diseases; and not only when such mitigation of pain, as of a dangerous symptom, helps and conduces to recovery; but also when, all hope of recovery being gone, it serves only to make a fair and easy passage from life. For it is no small felicity which Augustus Caesar was wont so earnestly to pray for, that same Euthanasia; which likewise was observed in the death of Antoninus Pius, which was not so much like death as like falling into a deep and pleasant sleep. . . . But in our times, the physicians make a kind of scruple and religion to stay with the patient after he is given up. Whereas in my judgment, if they would not be wanting to their office, and indeed to humanity, they ought both to acquire the skill and to bestow the attention whereby the dying may pass more easily and quietly out of life. This part I call the inquiry concerning '*outward euthanasia*,' or the easy dying of the body (to distinguish it from that Euthanasia which regards the preparation of the soul); and set it down among the desiderata.[6]

This subject does not seem to have been thoroughly studied at all up to the present time. Most physicians, once they see the expected result of their treatment to be wanting, and once they are convinced of the hopelessness of the patient's case, start to lose interest themselves, thinking they have all but discharged their duties if they have made ample use of the therapeutic means, believing they are dealing with a disease, not with a human being. Those very few, indeed, whom God has given a nobler heart will just then, with no shining ray of hope remaining, consider it their more lofty duty to lay to peaceful rest a life they can no longer save. Accordingly they will extend their energy and their affection,

[6] Bacon. *Advancement of science*, IV, 2.

they will follow each successive turn of events, they will apply palliatives wherever they can, and with an all-caring heart they will put themselves in readiness for the great event, so that the last breath of passing may be light and not dreadful to those left behind.

There are three points on which the doctor's efforts to discharge this sacred duty can be observed: first, that he by every means possible alleviates the patient's condition through foresight and guidance; second, that he avoids and removes everything that might increase the patient's pain and suffering; third, that he cheers the patient's soul and mind with gracious and convincing comfort. In the fourth place may be added consideration of objects and of persons that such care embraces. To follow this too literally and to write down just what should be done in any particular case would be unending and fruitless labor. Nor will such a thing be expected from this paper, limited in its scope as it is. However, points of general interest and those constituting in a way the main subject of this treatise, those to develop in a comprehensive manner seems to be the guiding principle of this study. May the reading of this paper fall on fertile ground.

For aiding the condition of a hopelessly afflicted patient, whatever can possibly be done through the doctor's foresight is best of all carried out by attendants and by properly trained nurses if they are considerate, watchful, quiet, clean, free of prejudice toward people, and if they follow, and adhere to, the doctor's orders with greatest obedience. (For training and obtaining such kind of people an institution with funds providing them with old-age insurance is needed. If only Professor Mai of Heidelberg could find followers of his example! A few years ago he gave free courses for married and unmarried women in which he taught clearly how those to whom the care of the sick is entrusted should deport themselves, and the expenditures for the undertaking were met by Amalia, Duchess of Baden. But the whole project died later on, together with the venerable old gentleman.) Indeed any people who move about the patient and give him a helping hand at his bedside, friends, domestic help, and relatives, should be required to be quiet and silent. Furthermore, care should be taken that no news is told him about any misfortune, danger, or death; not many people should be admitted just to see him lest those persons in their obtrusiveness cause noise and stir. For this reason even the doctor will not enter too often: but all should deport themselves in such a manner that the patient feels affectionate attention from

human beings, and that he gains the conviction of being best cared for by them.

What would be more desirable than pure and fresh air in a secluded room? Therefore as often as is possible in view of the kind of illness, site of sickroom, and position of bed as to doors and windows, the air should be purified and renewed or, if this is less permissible, refreshed with fumigating agents obtained through the doctor's prescription. Whatever can contaminate or deteriorate the air should be moved far out of the sickroom, and the greatest cleanliness should be observed within and around the bed. Who does not see the importance of this in cases of stool incontinence, excessive diarrhea, of ample secretion of pus or of purulent matter? For that purpose much is accomplished with beds whose mattresses consist of small sections which can be easily pulled out and others put in their places.

A suitable and comfortable position of the patient in bed will offer greatest relief, particularly where parts are swollen and painful, such as in hydrops, especially in hydrothorax, after serious amputations, or when bedsores tend to deepen. Among the many beds designed for this purpose which have been recommended here and there, like recently in England,[7] one is worth remembering that is in use for hydrothorax in the Karlsruhe Military Hospital. This can be raised and lowered at its head and foot ends by straps attached to a bedtable.

Bedsores, often the most vicious and almost unbearable affliction of these patients, will be obviated without much difficulty if greatest cleanliness is observed and if bedsheet folds are avoided which is customarily done by the use of thin bedsheets made of buckskin. The physician's alertness must be directed toward suspecting such afflictions in any protracted illness. For those patients may be already deprived of their sense of feeling, may suffer from numbness and stupor, may be seized by paralysis of their limbs, may rarely raise their voice, rarely complain. The doctor will with his own eyes repeatedly search for bedsores. For the same reason he will, as a matter of routine, also go over the patient's dry tongue and pharynx and will moisten them.

It is easily apparent what can be accomplished by administration of medicines where there is no room for the preservation of life or for the restitution of health. What good will it do the incurable patient to apply dangerous and dubious therapeutic measures?

[7] *Edinburgh med. surg. J.*, 1820, *16*, 296.

The entire plan of treatment will here confine itself within "symptomatic and palliative indication." The doctor will indeed keep only in mind, not by what means he may restore to normal the whole organism, but in what way he may eliminate or curb any particularly harassing episodes and attacks of the disease and the stern signs of nature in battle, such as anxiety, pain, torment, spasm, convulsion, restlessness, long-drawn-out sleepless nights as well as excessive secretions and excretions. Soothing, soporific, sedative, analgesic, and antispasmodic medicines will answer such a purpose; and these may be either external like plasters, instillations, enemas; or internal, the latter so much easier tolerated in liquid form like refreshing draughts, syrups, elixirs, mixtures, and tinctures. Their choice and composition depend on the type of illness and on the type of patient. An antiphlogistic should be chosen if the presenting symptom indicates trouble caused by excessive stimulation of blood supply, which, however, will hardly occur when all vitality has ceased. More often some morbid tension has to be diminished or relieved, muscle fibers to be relaxed, irritation to be removed or bandaged, or dried up parts to be soothed, for which emollients are suitable. Most often, however, the problem is to relieve and to overcome hypersensitivity, whether limited in scope or generalized, and particularly to cope with excessive activity of the central nervous system. Here narcotics are of enormous help. These, if properly and cautiously administered, are the most salubrious medicines for the whole human race and particularly appropriate for euthanasia. For they lower and suppress at all times overactivity of the nervous system, remove temporarily bodily pain and anguish, produce a sleeplike state, procure rest for the mind, and imbue with pleasant forgetfulness the sensory system, by now already blunted to outside impressions. In their use, however, we should be on the alert for untoward and side effects. It should also be borne in mind that modes of action of various drugs differ in every individual, and that each has its peculiar range of effectiveness, and that in larger doses all of them not only produce stupor but closely approach the character of poisons. It should also be known in what manner the various drugs manifest their effectiveness, whether "directly," where they instantly seem to overwhelm the central nervous system and the brain, like those containing cyanide, aqua laurocerasi or bitter almonds; or "indirectly," by stimulating in small doses the circulatory system and with this very stimulation subduing the nervous system and

the brain, like opium and hyoscyamus; or by simultaneously stimulating and electively acting on the mucous membranes, the solvents and sedatives like conium maculatum and belladonna. Accordingly it stands to reason that the various drugs can be administered either individually or combined with one another or with different ones. Definite specific qualities may not be ascribed to those individual drugs, but someone thoroughly trained by practice and experience will remember particular drugs to be especially affinitive to particular organs and diseases. It so happens that drugs containing cyanide and opium are principally administered for cancerous ulcers of the uterus and of the breasts, belladonna for scirrhus and for marked sensory disturbances of the organs of locomotion; similarly opium and what is derived from it, called morphine, in melena, cholera, lead poisoning, tabes, tetanus, trismus, and most of all in consumption of the lungs against the cough by day and by night as well as against the continuous liquid diarrheas. Only moderately effective in the treatment of cholera, opium has been called "the blessed anchor," whereas in consumption as a sedative it is called "solace of the phthisics." Who is not moved by this kind of mortal crisis, by such torment of the soul? Where the ability to swallow has gone, where mucous secretion becomes tenaciously adherent, where the breath, heaved from the chest, becomes more and more labored and noisy for two days and even longer, there the dying has a right to be deprived of all consciousness. Here opium will, without adding any new torment, make life's end a lenient one. Lactucarium, the heavy juice of lactuca sativa, will produce restful sleep without causing passive congestion to the head. Hyoscyamus may take the place of opium, particularly as the latter harms the bowel function, nor will it deny help in spastic afflictions of the lungs, in hemoptysis and in consumption of the larynx and of the trachea. In serious bone diseases, in white swelling, and also in facial pain conium maculatum will often prove itself to be most effective.

There is still another duty inherent in the doctor's power to avoid unnecessary suffering, and that in two ways. First he will see to it that no medicines are senselessly given from which all human nature, and not the least the sick, shrinks back in horror, like the harsh, the bitter, the sickening ones, or the external irritants or those causing blisters, the caustics, and other tortures for a nearly disintegrating body. More often than one would believe, it does happen that through such so-called remedies, which almost never

are of any help, the dying's last breath is choked with pain and sorrow.

In the second place the serious and important question arises: Where it appears that a slight chance to save a life depends on the surgical knife, should the patient undergo the hazards of a questionable "operation"? By no means can it be denied, and every day's experience proves it, that occasionally, under most unfavorable conditions of physical strength, a life has been saved and extended only by performing a paracentesis, a lithotomy, herniotomy, amputation, or trepanation. But on the other hand, just as many, who with equanimity and with greatest patience submitted to the surgeon's incision, died under excruciating pain either right under his eyes or a few days later. Who on earth whose mind is open to any sense of mercy does not shrink from such a sight where the most cruel operation is performed even when one may recognize approaching death from the limbs and from the face? Indeed those surgeons who for mankind's and for science's sake, without any thought of themselves, hesitatingly enter the uncertain path of experimentation should imprint into their minds the words of Bichat: "Those operations are dreadful therapeutic measures where assurance of retarding fatal outcome can be bought only at the risk of precipitating it. Successes are interspersed with failures, and the real results are at times only cruel surgical exploits. The virtue to stay away from those operations should be rated higher than the virtue to perform them well; and if there is any doubt as to their indication it is a wise move not to go ahead."[8] Particularly where a local lesion is the result of generalized humoral disintegration, and where even by undertaking surgery little hope remains as to recovery, the experienced physician should apply himself much rather to euthanasia than to surgery.

Now, however, let us approach that task of the physician which is less concerned with dispensing medicines than with administering some kind of higher comfort. Whoever refuses his part in this duty and assigns it solely to priests deprives himself of the most noble and rewarding aspect of his work. Where the priest, administering the sacraments, comes to the bedside to soothe the longing soul with the last solace of religion and of comfort, who will not see the patient's deep shock when he faces this quasi-harbinger of death? The physician, on the other hand, to whose sight the patient's eyes are accustomed, from whose hand he is used to receive

[8] Bichat. *Oeuvres chirurgicales.* Paris, 1798, I:8, p. 28.

relief in his misery, from whose lips he is used to derive hope for the future, whose entrance is always expected and desired, can even in utter despair speak out freely what no one else may be permitted to mention. Take, for instance, the writing of a will, often desired by the family who yet do not dare to ask this of the patient for fear of upsetting him with thoughts about his estate. Every single person should be aware of this duty while enjoying good health and full strength so he can at all times say: "I am ready for death, hence I may enjoy life."[9] But where a will has been neglected, no one is more fitted than the doctor to remind his patient of this fact. For with encouragement and with promise he will bring spirit to the dejected, hope to the fearful, confidence to the despairing. Likewise he may tell him how often other people have recovered from more serious illness, or how many effective medicines for aid and support are still available, or he may cheer up his patient's mind in many ways, holding out the prospect of a bluer sky, of fairer weather, and even of a trip to hot and medicinal springs.

Furthermore, when all hope is gone for the patient and when death draws nearer and nearer, the doctor will not desist from his efforts to help. As he knows from experience how to alleviate the supreme anguish of the patient's mind by conferring confidence to the dying about the safe and secure future of those to be left behind, his wife, his children, his dearest stakes in life, he will now put forth his best efforts in this kind of comforting. Likewise he will assure the doubtful and agitated of an honorable funeral and of a not-too-hasty interment. Finally, as a truthful interpreter of nature, he will relieve the troubled from his fear of complete extinction by giving him hope of immortality and of everlasting life of the souls. "Don't shrink away from that day as if it were the last one, for it is the birthday of eternity."[10] Since nothing of earthly matter is destroyed, why assume extinction of the mind, partaker of the divine spirit? This theory is not only compatible with our inborn desire for fairness and truthfulness, it is based also on the unshakably firm conviction of the wisest men. The more he who administers this comfort is a noble-minded man himself and irreproachable and blameless in life and esteemed by his patient for his skill, his devotion, and his effort, the more likely he will succeed in reassuring his patient's mind.

[9] Seneca. *Letters to Lucilius,* LXI. [10] *Ibid.,* CII.

At the approach of the last moments care should be taken that more and more silence and quietness is maintained around the bedside and that anything unpleasant is removed from the eyes of the departing. All of the dearest ones, if they can bear staying with him, should with poise, their grief concealed, endure the final sigh. Wrong indeed is the opinion of those who claim that the presence of the dearest ones makes the passing harder. Where there is love, life is sweet and death is not bitter. Thus it is related that Caesar Augustus passed away calmly under Livia's kisses. The hearing in particular, last of the senses to abandon the dying, should not be blotted out with noise, nor with lamentation, nor with the mournful sound of funeral songs. It should much rather be soothed and lulled to sleep with sweet chords from harps and flutes, unless deep silence is preferred. There is a custom of cruel people who deafen the ears of the departing even with howling and with the shrill din of trumpets and of metal tools.

Now, when on first inspection death has apparently arrived, as shown by the cooling off of the body, cessation of respiration and of the heart beat, the duty toward the deceased is not yet fulfilled. Instances are known where individuals at that stage, after cessation of all motor function, have perceived over a number of hours everything that took place around them. "For this is peculiar to all of us mortals, born to live through the strangest adversities, that we must not take anything for granted about man, not even his death."[11]

It is wise, therefore, to see to it that the deceased is not taken out of the natural warmth of his bed, that his nose, his mouth, or eyes are not closed as is indiscriminately being done, nor should his face be turned upward, nor should he be placed on a straw tick, nor on the bare floor. He should much rather quietly remain either in his house or in a public building designed for this purpose, and he should be guarded by attentive and watchful persons until it becomes evident that the abdomen is swollen, the intercostal muscles greenish, the privates dark, the cornea cloudy and full of phlegm, the lips and the tips of fingers and toes dry and blackish, the nails bluish, the skin loose, the expression of face and mouth changed and distorted. Then it will be clear that, with all ties to any spiritual life finally severed, there is no room for hope or, for that matter, for fear.

In the fourth and last place the doctor's task in providing

11 Pliny, *Natural history*, Book VII, Chap. LII.

euthanasia concerns his duty to pay attention to the speed of progression of the disease process, to the kind of illness, and to the patient with regard to temperament and age group.

The speed of progression of the disease process is certainly of great importance, in order to find out, if at all, just when the task should be fulfilled. This will generally be the case when there is no definite trace left of nature's own healing power or of the value of therapeutic agents, or when neither of them seems to promise any help. It behooves the intelligent and foreseeing neither to come to any rash conclusion in this matter nor to divulge such to the family or to those who remain at the patient's bedside. For we are subject to human nature, and we don't know yet the whole medical armamentarium, and it is altogether better to wait for future developments in such a case and to think of remedies against them than to pronounce something for certain that also may take a different course of events. "As for the patient, as long as there is life, there is hope."[12]

It is therefore the physician's duty to make an effort to extend the span of life in every way, and least of all should he be permitted, prompted either by other people's requests or by his own sense of mercy, to end the patient's pitiful condition by purposely and deliberately hastening death. How can it be permitted that he who is by law required to preserve life be the originator of, or partner in, its destruction? This would be both against religion and against utterances of the wisest men. "Pythagoras forbids that you desert your stand and post in life without orders from the supreme commander which means God."[13]

Among the diseases are a few which in particular deserve the utmost of a helping hand, like the contagious and the offensive diseases and the dangerous injuries. In these groups belong chronic arthritis, paralysis, infestation with lice, scurvy, syphilis, Polish plait, bubonic plague, yellow fever, leprosy, chronic mania, blindness, deafness, all kinds of hydrops, epilepsy, consumption of the larynx, of the trachea and of the lungs, cancer, malignant favus, and varicose ulcers of long standing. The less hope is left him for maintaining health and life, the greater should be the effort to conceal this from the patient and to let him have at least some relief from his pain. Occasionally it develops that some measure of aid and relief is inherent within the disease process itself. So,

12 Cicero. *Letters to Atticus*, IX, 10.

13 Cicero. *Cato major, an essay on old age*, XX.

at the approaching end of phthisis, or during the hydrothorax stage, the patient's hope seems even to increase, and he makes plans for what to do in the coming years. He will plan business transactions and particularly trips, and with this idle pastime he will be deceived about his failing life. Also in phthisis, yet even more in tabes and in other affections of the central nervous system, shortly before the end all manifestations of life are increased as if the heavenly soul freed itself from the consumption of the body. Here and there it has been observed that a previously unknown mental alacrity is discernible as well as a quasi-mystic frenzy from a divine impulse and in long intervals a clear and prophetic vision.

There are situations where indeed an even larger measure of duty is forced upon us to help one another. Thus the person indispensable to others, the head of a large family or of a poverty-stricken house, a father, a mother, the one and only son or friend, or someone who set out from his homeland into a foreign country and is now away from his family and among strangers, perhaps among adherents of a different religion, may lie prostrate, afflicted with grave illness; the more bitter the passing from life may be, the more all these wait for a gentle hand to help them go to meet death.

For a proper understanding of the temperaments a brief look into their characteristics is in order. He who is subject to a sanguinic temperament, also called irritable and soft, endures pain the least. Just as all drive and impulse in life takes place quickly but without inner strength and perseverance, so the mind is very susceptible to receiving external impressions but is not able to retain them for a long time or to resist them. By the spectre of death he is therefore extremely stirred up, and it is not in him to protect himself defensively. The choleric, who may also be called the hot tempered and the passionate, in whom there is a great impulse of vital energy, a great speed and assiduity in carrying on and in accomplishing, an acute keenness of mind and a quick clearness of judgment and at the same time a vigorous impulse of passions, he will be reluctant to realize that he is bound to die, and he will spend his last moments in struggle and violence just as he did all through his life. The melancholic, who should also be called the downcast and the silent, delights in a temperate sensitivity. Retired within himself and absorbed in silent contemplation of conditions, he will not be much affected by the outward appearance of things, and his love of loneliness and his endurance of pain will be remarkable. The dread of death he will therefore bear with

a balanced and serene mind with hardly any complaint uttered. The phlegmatic, whose temperament may be called passive and inert, will in his whole build, in all his bodily functions and mental reactions, exhibit an indolent and relaxed sluggishness as well as complaisance and equanimity of living. A decrease in his strength will hardly be noticed because at its height it showed little if any impulse, and the entrance of death will be concealed in solitude and in persisting weakness.

Finally the various age groups require separate study of the treatment appropriate for each. Death of babies is almost painless. Swiftly and violently they are seized and consumed by illness with no faculty of resistance; by the same token they are immune to diseases that develop from a tormented mind. And yet it is the physician's duty to render these little ones every care that might alleviate their brief suffering, particularly in congenital malformations like hydrocephalus, rickets, and others; for they may cry very little for much needed help, or they may be neglected by their families tired of the long lasting burden. Babies considered dead should be kept in the warm bed until undeniable signs of death appear. For often they are merely unconscious, or they may pass into a stage resembling death; and once really chilled, they are hard to resuscitate. In later childhood and in adolescence death will also befall the patients in an extremely gentle way. They may still be conscious, but illusions interfere more and more with their sound judgment of events. Thus it happens, and it may cause some astonishment, that occasionally young people in their happy prime are seized by a desire to die; as if the mind, not having tasted worldly pleasures, had embraced a vision of some higher fatherland. An ancient sage once said: Those whom the gods love, die young. In manhood, however, dying is bitter. Then the individual has reached maturity, and he realizes that medical resources have reached an end; he realizes the affection of his family, the kindness of his friends, and he goes over his earthly possessions, often acquired by hard labor and toil. To bid farewell to all this fills him with sorrow and grief, and the mind of the dying is greatly shaken with worry about those he is about to leave behind. All this takes place much easier in old age where death presents itself not in adverse or hostile manner but rather beckoning and begging. "Verily, just as fruits of trees are torn off by force when they are young, but fall off when ripe and mature, so life is taken from the

young by force, from the old by ripeness."[14] When keenness of senses, when generation of heat and of blood is gone, the bonds with life are loosened one by one by the slightest impulse. The flexor muscles which already dominated in the fetus prevail again over the extensors, the head falls down against the chest, the spine becomes curved, the soft tissues shrink towards the bones, and life, weakened by old age, is silently scattered into the air. "But that ending of a life is best where nature disjoins its own work and structure with mind and senses still clear."[15]

Laid to rest in such peace, the aged is presented with euthanasia, nature's own finest gift, not that of any human being.

When the physician has thus become adept in the whole knowledge of this art in medicine, he may be in good and cheerful mood for he may some day expect a like service from others. To the best of his ability he has undertaken to administer euthanasia; athanasia[16] he is unable to give.

"If his time is determined, if the number of his months is in your hands, if you have decided on his end which he may not escape; pass by him so he can fulfill, until your servant delights to go through his day of destiny."[17]

14 *Ibid.*, XIX.
15 *Ibid.*, XX.
16 Greek, meaning "immortality." (W.C.)
17 *The Holy Bible*, Job XIV, 5, 6.

Notes and Queries

Edited by Ralph H. Major, M.D.,* and Dorothy M. Schullian, Ph.D.†

Centenary for Daniel Drake

On 27 May 1952 the Cincinnati Academy of Medicine and the University of Cincinnati joined to commemorate the one hundredth anniversary of the death of Daniel Drake, which occurred on 5 November 1852. The Academy's special committee, composed of Doctors Marion A. Blankenhorn, George X. Schwemlein, and David A. Tucker, Jr. had worked long and tirelessly in developing a program which, on the appointed day, was presented with conspicuous success.

In the afternoon, at a Memorial Plaque Ceremony at the grave of Dr. Drake in Spring Grove Cemetery, the stone was rededicated with remarks by Dr. Blankenhorn, Dr. Drake's remote successor as Professor of Internal Medicine at the University of Cincinnati. Dr. Blankenhorn, in searching out Dr. Drake's grave and laying flowers upon it on Memorial Day, 1950, may be said to have initiated the 1952 ceremonies. The faded lettering which he found on the original stone is now reproduced on a bronze plaque presented by the physicians of Cincinnati. Added solemnity was imparted to the plaque ceremony by the presence of Dr. Edwin W. Mitchell, ninety-eight-year-old Professor Emeritus of Clinical Medicine at the University.

Dr. Cecil Striker, President of the Academy, presided at the dinner at the Vernon Manor Hotel at which Dr. Frank H. Mayfield, Immediate Past President, presented for official use by the Academy a gavel turned from wood taken from the sill of the house at 429 E. Third Street where Dr. Drake once lived. Congratulatory messages were read, including greetings from "Osler's ashes, his books, and his pen."

Any Drake ceremony today would be woefully incomplete without the presence of Drake's eminent biographer, Dr. Emmet Field Horine, Clinical Professor of Medicine and Chief of the Section on Medical History, University of Louisville School of Medicine. In almost thirty years of research Dr. and Mrs. Horine have issued a series of articles and books which have revealed with authority much that was obscure in the life of Drake. Their definitive biography is to be published soon. At a convocation that evening at the auditorium of the College of Medicine of the University Dr. Horine gave the commemorative address, "Cincinnatian Unique: Daniel Drake." Dr. Raymond Walters, President of the University, presided, and following the address he conferred the honorary degree of Master of Arts upon Dr.

* Department of Internal Medicine, The University of Kansas School of Medicine.

† History of Medicine Division, Armed Forces Medical Library, 11,000 Euclid Avenue, Cleveland 6, Ohio.

Horine and of Doctor of Letters upon Dr. Ralph H. Major, Professor of Internal Medicine at the University of Kansas and retiring President of the American Association of the History of Medicine. Dr. Horine was presented for the degree by Dr. David A. Tucker, Jr., Professor of the History of Medicine, who has recently issued, through the Institute of the History of Medicine in Baltimore, a reprint of Drake's *Practical Essays on Medical Education and the Medical Profession in the United States.* Deserving of mention in this journal is the Chinese proverb quoted by Dr. Tucker, "He who looks back to the old and knows the new is worthy to be a scholar." Dr. Major was presented for the degree by Dr. Stanley E. Dorst, Dean of the College of Medicine. Dr. Philip Zenner, Professor Emeritus of Neurology, who was born a few months before the death of Drake and who celebrated his one hundredth birthday on 17 May 1952, participated in the convocation in full academic regalia.

A special exhibit commemorating Drake had been prepared by the Historical and Philosophical Society of Ohio at the Taft Museum. The following day the new Daniel Drake Memorial Hospital at the Hamilton County Home was dedicated. For the Drake festivities the *Cincinnati Journal of Medicine,* under the chief editorship of Dr. George X. Schwemlein, issued a special memorial number (Vol. 33, No. 6, June 1952), beautifully illustrated, which carries the remarks and addresses of Doctors Striker, Horine, Blankenhorn, and Mayfield. Full and accurate coverage of the various ceremonies was provided by the local press. Particular mention should be made here of *The Cincinnati Enquirer,* which, with the sponsorship of the Academy of Medicine, devoted one entire section (20 pages) of its issue of Sunday, 25 May, to the Daniel Drake Centennial. The leading article, on Drake, was contributed by Dr. Tucker; other articles trace the development of medicine in Cincinnati during the last hundred years and the history of its modern medical institutions. Even advertisers united in saluting Drake. When not only medical supply houses and druggists but also department stores, restaurants, and the like can give space to an outstanding figure in the history of medicine, one may hope and suspect that the general public also awakens to an appreciation of the importance of the past.

Retirement of Dr. Urdang

It is hardly necessary to record in detail for readers of this journal the outstanding work of Dr. George Urdang at The American Institute of the History of Pharmacy in Madison. Dr. Urdang retired this year, at the age of seventy, from his post as Professor of Pharmacy at the University of Wisconsin. He had come to this country in 1939 after an eminent career as pharmacist and historian in Germany. Trained at the Universities of Leipzig, Berlin, and Halle-Wittenberg, he edited for many years the *Pharmazeutische Zeitung.* His numerous publications abroad and in the

United States have elucidated both the technical aspects of pharmacy and its history. Anyone who knows him will not doubt for a moment that in the greater leisure now at his disposal he will continue to work toward the aims which have guided him hitherto and to stress the humanistic ramifications of the profession. This journal extends to him hearty good wishes for the years ahead.

An Autograph of Morgagni

In October of 1950 my library was enriched by a splendid copy[1] of the first edition (Padova, Josephus Cominus, 1721) of Giovanni Battista Morgagni's

JO. BAPTISTÆ

MORGAGNI

In Patavino Gymnaſio Primarii
Anatomes Profeſſoris

EPISTOLÆ DUÆ

ALTERA IN

AUR. CORN. CELSUM,

ALTERA IN

Q. SER. SAMONICUM.

PATAVII. CIↃIↃCCXXI.

Excudebat JOSEPHUS COMINUS

. *SUPERIORUM PERMISSU.*

Pvgil. Viw B. Pvr Michaeli Sagna
Annvis Bonum, et obsequium

Fig. 1. Title-page of Morgagni, *Epistolae duae altera in Aur. Corn. Celsum, altera in Q. Ser. Samonicum*, 1721.

[1] The gift of Miss Dorothy M. Schullian.

Epistolae duae altera in Aur. Corn. Celsum, altera in Q. Ser. Samonicum. This was the first important work in medical history of the great Italian anatomist and pathologist, who lived from 1682 to 1771. For this copy interest is heightened by the following dedication written on the title-page by Morgagni: *Praecl. mo Viro D. Petro Michaeli Gagna/ Autoris Donum, et obsequium* (Fig. 1). Information on Gagna is scarce, but a few facts are provided by Giov. Giac. Bonino in his *Biografia medica piemontese.*[2] Pietro Michele Gagna was a native of Cherasco in Piedmont and a member of its college of medicine. He served as physician to the Princesses Maria and Isabella of Savoy-Carignano. These facts may have been taken by Bonino from the title-page of Gagna's *De peste tractatus historico-medicus latino ac italico idiomate descriptus* (Torino, Jo. Franciscus Mairesse and Joannes Radix, printers to the Accademia degli Innominati at Bra, 1715), a copy of which is available at the Armed Forces Medical Library. Bonino also gives the text of an inscription dated 1722 which decorated the Gagna house in Cherasco.

LUIGI BELLONI

Concerning the Death of Queen Caroline

The fatal illness of Queen Caroline, wife of George II, contains several interesting medical episodes. She appears to have died from intestinal obstruction due to a strangulated umbilical hernia. The account of her death has been so vividly described by several contemporaries, and especially by Lord Hervey,[1] the Boswell of the royal family, that it seems worth while to recall the incidents for the interest and amusement of the modern reader.

On 9 November 1737, the Queen was suddenly taken ill with severe abdominal colic and vomiting. But with her usual self-sacrifice and sense of public duty she continued to entertain her guests. Hervey, however, remarking on how ill she looked, said, "Would to God the King would have done talking of the Dragon of Wantley [a popular silly farce of the day], and release you."[2] Eventually the company was dismissed, but with the King grumbling that she had neglected speaking to one of his guests.

That same evening, as the pain increased, Lord Hervey, considered an expert in medical matters because of his own ill health, much of it hypochondriacal, was naturally asked for advice. His mixture of brandy and snake-root was considered too strong a cordial by the household physician, Dr. Tesier. The latter, however, was so timid by nature that he did not even dare to suggest to the King that another physician be called. Eventually

2 Torino, 1825, vol. 2, p. 62.

1 Hervey, Lord John. *Some materials toward memoirs of the reign of King George II.* . . . Edited by Romney Sedgwick. London, 1931. Vol. 3, pp. 877-920. See also the earlier edition, by John Wilson Croker, *Memoirs of the reign of George the Second from his accession to the death of Queen Caroline.* London, 1848, Vol. 2, pp. 490-545.

2 Hervey, ed. Sedgwick, p. 878.

Mr. Ranby, the King's "house-surgeon," was summoned; he administered several purgings, a bleeding, and a clyster, but without the slightest benefit. During the night the King felt such anxiety over her poor condition that "inconveniently both to himself and the Queen, [he] lay on the Queen's bed all night."[3]

The next morning another bleeding brought down her temperature, and by then absolute constipation had been added to her trials. It seems that from the beginning she had no doubt as to the outcome. To her daughter she said, "Poor Caroline! you are very ill too; we shall soon meet again in another place."[4] (The Princess died two months later, probably from consumption.) Perhaps the Queen felt obliged to die, as two years earlier, whilst engaged in one of his amours at Hanover, the King had said that "it was unreasonable a woman after fifty should expect her husband should lie with her."[5]

A levee was held that day as usual, and the King in the midst of his great concern for the Queen ordered that his last new ruffles should be sewed on his shirt. As Hervey observes of this, "Such sort of particulars will seem very trifling to those who do not think, like me, that trifling circumstances often let one more into people's tempers and characters than those parts of their conduct that are of greater importance, from which one frequently knows no more of their natural turn of mind than one does of their natural gait whilst they are dancing."[6] Dr. Hans Sloane (best known today as the founder of the British Museum) and Dr. Hulse were brought in. Further aperients and blistering were inflicted upon her without the slightest relief. The Earl of Egmont says[7] that Dr. Hulse believed Her Majesty could not recover, but this prognosis so annoyed the King that he gave him a box on the ear.

There had been a bitter quarrel between the Prince of Wales and his parents for some time. For example, a court circular dated 12 September 1737, two months earlier, states: "Notice is hereby given to all peers, peeresses, privy councillors and their ladies and other persons in any station in the service of the King and Queen, that whoever goes to pay their Court to their Royal Highnesses, Prince or Princess of Wales, will not be admitted into their Majesties' presence."[8] To some degree this estrangement was due to the Prince's support of the Tory opposition and the "Patriots" (of which the leading spirits were Pitt and Fox) against the government led by Sir Robert Walpole. The Queen wondered when the Prince would ask to see her, and said, "He will think it will have a good air in the world . . . and perhaps hopes I shall be fool enough to let him come, and give him the

3 *Ibid.*, p. 881.
4 *Id.*
5 Egmont, John Percival. *Manuscripts of the Earl of Egmont. Diary of the first Earl of Egmont (Viscount Percival)*. London, Historical Manuscripts Commission, 1923, Vol. 2, p. 445.
6 Hervey, *loc. cit.*
7 Egmont, *loc. cit.*
8 Yorke, Philip Chesney. *The life and correspondence of Philip Yorke Earl of Hardwicke Lord High Chancellor of Great Britain*. Cambridge, 1913, Vol. 1, p. 182.

pleasure of seeing my last breath go out of my body, by which means he would have the joy of knowing I was dead five minutes sooner than he could know it in Pall Mall."[9] Sometimes she would cry, "At least I shall have one comfort in having my eyes eternally closed—I shall never see that monster again."[10] This attitude is perhaps not unreasonable when one learns that while on the one side the Prince was sending messages of good wishes to his mother every hour, he was saying to his friends, "Well, sure, we must have some good news soon. 'Tis impossible she can hold out long. I think I am a very good son, I wish her out of her pain."[11]

On the third day the King disclosed to the doctors, much however to her annoyance, that the Queen had kept from them the information that she had an umbilical hernia. Apparently he had noticed this many years before and had begged her to see a surgeon. Fearing however that any blemish might weaken her hold on him, she had refused, and extracted a promise from him never to raise the subject again. As Hervey says, "She would have died without declaring it, or letting it be known, . . . and though people may think this weakness little of a piece with the greatness of the rest of her character, yet they will judge partially who interpret this delicacy to be merely an ill-timed coquetry at fifty-four that would hardly have been excusable at twenty-five. She knew better than anybody else that her power over the King was not preserved independent, as most people thought, of the charms of her person; and as her power over him was the principal object of her pursuit, she feared, very reasonably, the loss or the weakening of any tie by which she held him."[12]

As a result of this disclosure two more surgeons, the aged Buissière and Shipton, were called. The first of these is said to have introduced lectures in anatomy into England.[13] Buissière favoured an attempt at making an opening in the abdominal wall and trying to replace the guts, but this was opposed by Ranby as "all the guts . . . would come out . . . into the bed."[14] Eventually Ranby's view prevailed and the swelling was lanced! As an example of the Queen's fortitude, the Earl of Egmont describes[15] how, during the operation, she asked Ranby, who was separated from his irritable wife, what he would give to be using his wife in the same manner. At this remark Buissière, who was standing by, set his wig on fire with the candle he was holding. This so amused the Queen that she asked Ranby if he would stop the operation for a minute to allow her to laugh.

The next day mortification had set in and a hopeless prognosis was given by the medical men. This was changed from day to day in alternate hope and despair. Further incisions into the swelling were made almost daily without the slightest benefit. Throughout these days the King, although

9 Hervey, p. 887.
10 *Ibid.*, p. 889.
11 *Id.*
12 *Ibid.*, pp. 891-892.
13 Nichols, John. *Literary anecdotes of the eighteenth century.* London, 1812, Vol. 4, p. 618.
14 Hervey, p. 892.
15 Egmont, pp. 445-446.

distracted by grief, could not prevent his extremely irritable temper from turning itself on the Queen from time to time. "How the devil should you sleep, when you will never lie still a moment? You want to rest, and the doctors tell you nothing can do you so much good, and yet you are always moving about."[16] His voice, so loud and disturbing, urged her to eat and drink. Eventually the Princesses got the medical men to make a written order that no one should talk to her more than was absolutely necessary. This prescription, after it had been shown to the King, was pinned on the curtain of her bed, but it had as little effect on the King as the treatment of the physicians had on the Queen.

On the ninth day, according to Hervey, "the Queen's vomitings returned with as much violence as ever, and in the afternoon one of the guts burst in such a manner that all her excrement came out of the wound in her belly. . . . The running at the wound was in such immense quantities that it went all through the quilts of the bed and flowed all over the floor. Some ignorant people about her who knew not from what cause this evacuation proceeded, told the Queen they hoped this relief would do her good, to which the Queen replied very calmly, she hoped so too, for that it was all the evacuations she should ever have."[17]

In taking her farewell of this life she commended to the care of Sir Robert Walpole "the King, my children, and the kingdom."[18] She urged her son William, Duke of Cumberland, to make up for the disappointment of his profligate and worthless brother, the Prince of Wales, and to keep up the credit of the family. Knowing, as she did so well, her husband's weaknesses, she urged him to marry again when she was dead. His reply, brought out with difficulty and between sobs, was, "Non—j'aurai—des—maitresses." "Ah! mon Dieu! cela n'empêche pas,"[19] was her immediate reply. She continued to lose ground and two days later she asked Dr. Tesier how long he thought she could last. He answered, "Je crois que votre Majesté sera bientôt soulagée." She calmly replied, "Tant mieux."[20] A few hours later that night she suddenly developed an attack of dyspnoea, ordered the window to be thrown open, and died within a few minutes.

Thus on 20 November 1737, died one of the most remarkable figures of the day, a woman admired for her literary qualities by Swift and Pope, the friend of Sir Isaac Newton, and the patron of the musician Handel. The latter himself (only just recovering from an attack of aphasia[21] and right hemiplegia) composed the funeral anthem, "The ways of Zion do mourn."

After her death the King was for some months tearful and superstitious. The Duchess of Marlborough recalls an incident at the card table: "Some

[16] Hervey, p. 910.
[17] *Ibid.*, pp. 905-906.
[18] *Ibid.*, p. 898.
[19] *Ibid.*, p. 896.
[20] *Ibid.*, p. 914.
[21] It seems from an examination of Handel's handwriting and contemporary accounts of him that this recovery was complete. This is of interest in connection with the problem of aphasia and artistic realisation, as some of his greatest works, including the *Messiah*, were composed after this illness.

queens were dealt to the King, which renewed his trouble so much, and put him into so great a disorder, that the Princess Amelia immediately ordered all the queens to be taken out of the pack."[22] We also learn that on "a Saturday night between one and two a clock the King waked out of a dream very uneasy and order'd the vault where the Queen is to be broke open immetiatly [*sic*] and to have the marble coffin also open'd, and went in a hackney chair thro' the horse guards to Westminster Abbey, and went down into the vault and stood and consider'd her coffin very attentively a good while and then went back again to bed."[23]

Eventually the Prime Minister pressed the King to send for Madame Walmoden (his mistress) from Hanover "for the sake of his family, and for the sake of all his friends, and not ruin his health by indulging vain regret and grief for what was past recall."[24] In the meantime he advised the King to take Lady Deloraine till Madame Walmoden could be brought over.

Although George II lived for another twenty-three years, eventually he died of a "broken heart." The autopsy findings described in the *Philosophical Transactions* of the Royal Society[25] show that the right ventricle had ruptured into the pericardial cavity.

RAYMOND HIERONS

American Association of the History of Medicine

Twenty-sixth Annual Meeting: Columbus, Ohio—April 10, 11, and 12, 1953

Dr. John F. Fulton, President of the American Association of the History of Medicine, has accepted the invitation of the Ohio Academy of Medical History and the College of Medicine of the Ohio State University to hold the next annual meeting of the Association in Columbus, Ohio, in connection with the Sesquicentennial Anniversary of the State. Among the groups collaborating in the commemoration, in addition to the two already named, are the Ohio State Medical Association and the Ohio State Archaeological and Historical Society. The meeting will take place April 10-12, 1953, with the annual dinner scheduled for Saturday evening, April 11th. The headquarters hotel will be the Fort Hayes; the auditorium of the Ohio State Museum has been made available for the meetings. Professor Linden F. Edwards, Department of Anatomy, Hamilton Hall, Ohio State University, Columbus 10, Ohio, is Chairman of the Program Committee.

[22] Marlborough, Sarah, Duchess of. *Memoirs . . . together with her characters of her contemporaries and her opinions,* edited . . . by William King. London, 1930, p. 295.

[23] Strafford, Thomas Wentworth, 3rd Earl of. *The Wentworth papers, 1705-1739, selected from the private and family correspondence of Thomas Wentworth, Lord Raby, created in 1711 Earl of Strafford. . . .* London, 1883, p. 538.

[24] Hervey, p. 919.

[25] Nicholls, Frank. "Observation concerning the body of his late Majesty, October 26, 1760," in *Philos. Trans.,* 1761, *52,* 265-275.

Book Reviews

GALENUS. *A Translation of Galen's Hygiene* (*De Sanitate Tuenda*) by Robert Montraville Green. With an Introduction by Henry E. Sigerist. Springfield, Ill., Charles C Thomas, 1951. xxvii + 277 pp. $5.75.

THE Galenic corpus is an enormous one (filling twenty-two volumes in the standard Kühn edition); and the style and spirit of various books attributed to this great author differ widely. Galen's greatest contribution in the field of personal hygiene is probably his analysis of the "Non-Naturals" or non-hereditary conditions contributing to health, which he lists as Food, Fresh Air, Exercise and Rest, Sleeping and Waking, Repletion and Evacuation, and the Passions and Affections of the Mind; but this extraordinarily acute classification (so far as the reviewer is aware) appears first in Linacre's sixteenth century Latin text, whose authenticity has been brought into question. In many of Galen's writings, as they appear in earlier manuscripts, there are remarkably perceptive comments on metabolism and the relation of food to growth and exercise.

The volume translated by Dr. Green treats very lightly of what we consider today the most important of the Non-Naturals, namely, food, fresh air, and the passions and affections of the mind. It is chiefly devoted to exercise and rest, sleeping and waking, and repletion and evacuation. The reason for this is clear. The book is not designed primarily for the medical profession (although there are many chapters on therapeutics) or for the general lay public. It is a text for the elite laity, "for Greeks and those who, though born barbarians by nature, yet emulate the culture of the Greeks." It is a book for the ruling classes of the time, for the patrons of the Thermae, designed to guide them in the techniques of bathing, of massage, of gymnastic exercise, of rest and recreation, which played such a major rôle in the life of Imperial Rome, and which indirectly throws much light on the life of the period. Emphasis on the evils of constipation was necessary to compensate for the Lucullan banquets in which the luxurious patricians indulged. Chapters on gerontology are particularly modern in their emphasis (including discussion of the upper respiratory diseases as special hazards for the aging); and the dangers of obesity are wisely recognized.

Dr. Henry E. Sigerist in a brief Introduction testifies to the fact that the translator "has fulfilled his task admirably." The only criticism which one might make is that an index would have been desirable. We owe a real debt to Dr. Green for his service and to the Julia Licht Fund which commissioned the work. It is to be hoped that the process of making the Galenic classics available to a generation in which Greek and Latin scholarship is so deficient may be continued; for Hippocrates and Galen represent the pinnacles of European medicine prior to the fifteenth century. They have

much to teach us by their successes and their failures as to those methods of thought which, after all, are the basic tools of scientific progress.

New Haven, Connecticut C.-E.A. WINSLOW

D. A. WITTOP KONING, Ed. *Art and Pharmacy.* A Collection of 42 Reproductions, Published in the Dutch Pharmaceutical Calendars, with an Introduction by Dr. Koning. Deventer Holland, De Ijsel Press Ltd., 1950. 12 pp. + 42 illus. $5.00.

THIS book containing some forty-two reproductions of historical illustrations of medical and pharmaceutical interest is a development of the German pharmacist's calendar first published twenty-five years ago by Ferchl, but those illustrations with one exception were not in colour. In 1939 Professor van der Wielen of Amsterdam produced a calendar in which the reproductions were in colour, and the publisher of these calendars was requested to produce a book containing a number of these reproductions in a more permanent form. Dr. Wittop Koning has written a rather extensive introduction to this book commemorating the work of Professor van der Wielen who died in 1946.

The pictures have been arranged in chronological order beginning with the patron saints of the professions, St. Cosmas and St. Damian, ending with an illustration of a modern Dutch pharmacy. The first picture is of a sixteenth century coloured wooden statuette of French origin of St. Damian, the patron saint of the apothecaries. The second one is a reproduction of a sixteenth century Russian ikon representing St. Cosmas and St. Damian; then follow reproductions of similar Russian ikons presenting in addition to the two patron saints, St. George (4), the patron saint of soldiers, and Eliah. Six and 7 are early Flemish and Spanish illustrations of the patron saints. Illustration 8 is of a tenth or eleventh century Persian bronze mortar, 15 is a sixteenth century Spanish iron mortar, 16 an ornamental apothecary's jar, 17 is an example of a decorated seventh century Venetian drug jar. These delightful examples of tools of the early apothecaries are all in the van der Wielen collection. A number of reproductions from very early manuscripts are included, e.g. one from a twelfth century German manuscript from the library of Eton College, illustrating the digging of herbs and the preparation of medicines. Two interesting reproductions are from the Dresden Galenus manuscript (11 and 12). Illustration No. 13 from *Das Buch des Lebens* shows the physician directing the apothecary in the selection of certain jars for the preparation of a medicine. It is interesting that in this early illustration all the jars in the apothecary shop are labelled with symbols of the two professions. Two illustrations of the Medical Pharmaceutical Museum in Amsterdam are given. Included is the celebrated picture by Brouwer (20), The Bitter Medicine, which illustrates the disagreeable nature of some of the earlier potions given to patients. There

are a number of reproductions of eighteenth and nineteenth century paintings showing the apothecary preparing and giving out medicines. The majority are of Dutch origin. The notes describing each illustration are given in French, English, German, and Dutch.

This work is an attractive collection, and while not exhaustive in scope, it should be of interest because of the range of reproductions and of their clarity and colour.

New Haven, Connecticut DESMOND D. BONNYCASTLE

ROYAL COLLEGE OF SURGEONS OF ENGLAND. *A record of the years from 1901 to 1950.* London, The Royal College of Surgeons of England, 1951. 4*ll.* + 80 pp.

AT the time of the Centenary Celebration of the Royal College of Surgeons in 1900, the President, Sir William MacCormac, published his *Address of Welcome*[1] to which he appended the lives of the Masters and Presidents of the College up to that time. Similarly, this present volume reviews the subsequent half-century.

In a brief history covering some twenty pages, a concise but informative report "shows how the College has fostered the progress of Surgery" during this time. Notable are its activities in respect to the museum, the library, and the organization of experimental research at the College in Lincoln's Inn Fields and the "surgical research farm" adjoining the home of Charles Darwin at Downe in Kent.

A major responsibility of the College has continued to be examining for membership and fellowship; more recently postgraduate courses have been instituted leading to diplomas in surgical and ancillary fields. At the moment through the beneficence of Viscount Nuffield, a residence for one hundred students is being provided adjacent to the College in conjunction with an "Institute of Basic Medical Sciences." Additional funds have also been obtained for research scholarships and fellowships.

The reconstruction and expansion of the College since the war, during which it suffered severe damage, has been truly remarkable and are testimonials to the tenacity and vigor of the Fellows of the College and its administrative offices. This is best realized by reading the "Lives of the Presidents" that comprises the remainder of the volume. During these fifty years the fruition of Lister's contribution to surgery was taking place in spite of wars and tribulations, and to a degree surpassing that of any previous period.

While this present publication is a material historical contribution, one awaits with great expectation the projected supplements to "Parr's Lives of the Fellows"[2] which appeared in 1930. This latter in itself is one of the

1 MacCormac, William. *An address of welcome.* London, Ballantyne, Hanson and Co., 1900. 220 pp.

2 Parr's *Lives of the Fellows of the Royal College of Surgeons of England.* London, Simpkin Marshall Ltd., 1930, Vol. I, 752 pp.; Vol. II, 596 pp.

great contributions of the Royal College of Surgeons and is in fact a history of modern British surgery.

New Haven, Connecticut SAMUEL C. HARVEY

RALPH CHESTER WILLIAMS. *The United States Public Health Service, 1798-1950.* Washington, D. C., Commissioned Officers Association of the United States Public Health Service, *c.* 1951. 890 pp. 4to. $7.50.

THIS history of the Public Health Service was prepared by a well-known senior officer who received assistance from numerous associates, old and young, in the organization. Information is presented concerning the origin, evolution, organization, and activities of the Public Health Service since its establishment in 1798—a record of progress and achievement of which the people in the United States may be proud, as health horizons have broadened. This record "comes to life" with nearly two hundred illustrations of activities and of photographs of people who were "first" or who occupied key positions or made other unusual contributions, some of which are suggested in the dedication referring to acts little known or publicized:

> . . . to those men and women of the Public Health Service who have given their lives in line of duty and to those who, through the past one hundred and fifty years, at the bedside of patients, at lonely quarantine stations, in raging outbreaks of epidemic diseases, in research laboratories, in time of peril and public disaster, at far-flung outposts, and at administrative desks, have given so liberally and unselfishly of their loyal efforts.

As to origins, the United States Marine Hospital Service, 1798-1902, was broadened to the United States Public Health and Marine Hospital Service until 1912, when the present term was adopted, namely, the United States Public Health Service. It is not surprising that the concept that the United States government should provide medical care for merchant seamen when sick or disabled came from the British Isles.

> There are references to indicate that the Chest at Chatham was originally planned by Sir Francis Drake and Sir John Hawkins in 1588 following the defeat and destruction of the Spanish Armada when the seamen composing the large victorious fleet became the national heroes. An act of 1696, Parliament of King William III, provided that seamen who registered for service and became disabled for service at sea, and "not able to maintain themselves comfortably," should be provided for in the Royal Hospital at Greenwich—a tax of sixpence per month being taken out of the wages. As demands for service increased, it was necessary to provide additional means, and, in 1747, officials were directed to establish a "sixpenny hospital" at Liverpool for the use of "decayed seamen, their wives, and children." The Boston Marine Society was formed in 1742, with a view to promoting the general interest of navigation and to assist unfortunate mariners and their families. The President of the United States, John Adams, approved an Act for the relief of sick and disabled seamen in 1798 and appointed Dr. Thomas Welsh of Boston as the first medical officer. From 1807 until the opening of the Massachusetts General Hospital in 1821, the Marine Hospital at the port was one of the sources of clinical material for the students attending the lectures at the Massachusetts Medical College of Harvard University.

In 1950, the Service operated 24 hospitals, 19 outpatient clinics (with full-time staff), and 103 outpatient offices (contracts with local physicians),

varying in size from 30 beds at Vineyard Haven, Massachusetts, to 1,400 beds at Lexington, Kentucky. These include two hospitals devoted to the care and treatment of persons addicted to the abusive use of narcotic drugs and a hospital for patients afflicted with leprosy. Both equipment and procedures conform with approved practices.

The book is divided into twelve chapters which deal, in addition to hospitals, with: activities on guard against disease from without, the evolution of public health, public health laboratory research, field studies and demonstrations, intra-governmental relationships, international health relations, leadership and leaders, those who carry on when wars come, World War II, and public health in the mid-twentieth century.

Among the many significant contributions which stand out in this valuable historical record is the foundation of a career service of world-wide influence and scope, with the recruitment, training, and effective use of specialists for consultation, research, and service, as leaders skilled in the measures for early discovery, prevention, and treatment of unnecessary illness and incapacity and in the promotion of health. Epidemiological studies and laboratory research are exciting avenues of achievement explored with fruitful results. International health affairs in war and peace have occupied the attention of a goodly number of the technical staff members engaged in the various aspects of public health. Nor have the rural areas nor the urban areas of United States been overlooked, although the calls for services have exceeded resources. The author has assembled a vast storehouse of information concerning this fundamental service of government which has grown over the 150 years as additional responsibilities have been given it by law and as funds were made available by the Congress for the benefit of the people of the Nation.

New Haven, Connecticut IRA HISCOCK

EDWARD KREMERS AND GEORGE URDANG. *History of Pharmacy*. Second edition, revised and enlarged. Philadelphia, London, Montreal, J. B. Lippincott Company, 1951. xiv + 622 pp., 30 illus. $7.50.

WITH the death of Edward Kremers, it devolved upon his co-author George Urdang to complete the enlarged second edition of this well-known monograph. The work, of course, is of unique interest for teachers of pharmacy and for pharmacists, pharmaceutical chemists, and so-called "medical pharmacologists." It is written chiefly for those dedicated to the profession of pharmacy.

This is a scholarly treatise with 483 pages of text. In addition a comprehensive bibliography, chronological table, appendix (or glossary) and index run up to 633 pages in all. The work is well conceived and lucidly presented. Part One deals with early backgrounds in the old world. Part Two discusses the rise of professional pharmacy in Europe, with emphasis

upon Italian, French, Spanish, and German movement as contrasted with the "peculiar English situation." Part Three (larger half of the text) considers pharmacy in the United States.

The American story is presented first in the light of major periods in the history of the North American colonies. Subsequently, it is analyzed in terms of associations, legislation, education, pharmaceutical literature, and economies. This discussion leads naturally to Part Four, which appraises the contributions of latter-day pharmacists to various walks and aspects of American life.

This is *not* a book primarily for practising physicians and surgeons, although the "medical pharmacologist" will find much of historical interest in the first half of the volume. It is a book which any self-respecting pharmacist or pharmaceutical chemist will wish for his personal library. In addition, obviously, every medical, chemical, and pharmaceutical library should own it—especially those with up-to-date historical sections. It is pleasant reading and highly informative. This was to be expected, because George Urdang is unexcelled in this field.

WILLIAM T. SALTER*

A. EARL WALKER, Ed. *A History of Neurological Surgery*. Baltimore, Williams and Wilkins Company, 1951. xii + 583 pp., 152 illus. $12.00.

THIS book is remarkable from the point of view of its broad perspective and its excellence as a piece of bookmaking. It has been compiled by Dr. A. Earl Walker and a team of active young neurosurgeons, some twelve in number, working in his clinic at Johns Hopkins. Despite the differing backgrounds of the authors, the eighteen chapters are notably even in prose style, which no doubt reflects Dr. Walker's painstaking editorial supervision.

The book begins appropriately with an historical "prologue' in which the story of prehistoric trephining is well told with appropriate illustrations. Incidentally, the illustrations throughout the book are of a very high quality which bears evidence of the skill of the engravers and the good presswork of the printers.

Dr. Walker himself contributes a long and most interesting chapter on diagnostic procedures, and this is followed by two chapters on the techniques of neurosurgery by Robert E. Green and W. Eugene Stearn. An interesting feature of the book, and one which gives it a warm human touch, is that each chapter, after the second, is followed by a biographical sketch of some important contributor to the progress of neurosurgery. The chapter on neurosurgical techniques is appropriately followed by a two-page biographical sketch of Harvey Cushing in which there is a quotation from Miss

* Died 29 July 1952.

Thomson's biography: "His death was not the end. Harvey Cushing, like a truly great teacher, had merely turned over his work to his pupils . . . in clinics and operating rooms the world over." The next chapter is followed by a thumbnail sketch of Walter Dandy, and so on throughout the book. Another interesting feature is that Dr. Walker has filled up pages that would otherwise have been blank with quotations appropriate to the subject matter of the chapter in question. Still another feature that gives an artistic touch to the book lies in the beautifully designed woodcut initials at the beginning of each chapter—initials reminiscent of the Vesalian *Fabrica*.

In the later chapters specific procedures are described and the historical development of each one is traced—procedures such as those involving exposure of the posterior fossa, the third ventricle, the pituitary—and there is a chapter devoted to psychosurgery. At the end of this latter chapter there are two interesting quotations in amusing juxtaposition. The first is from an editorial in the *Medical Journal* for 1940 entitled "The Lobotomy Delusion" in which the psychosurgeons come in for scathing criticism. This is followed by Dr. Viets' notice concerning the 1949 Nobel Prize in Medicine which was awarded to Dr. Egas Moniz.

Other neurosurgical problems are dealt with in the later chapters: craniocerebral trauma, cerebral vascular anomalies, epilepsy, surgery of pain, congenital anomalies, spinal cord surgery, surgery of peripheral nerves. There is a final chapter on surgery of the autonomic nervous system.

Dr. Walker's volume is invaluable as a work of reference and is made the more so by a full and accurate bibliography running to 2,371 references carefully compiled with *World List* abbreviations. From beginning to end it is a scholarly production which will cast great credit upon its chief compiler and his associates, and also upon American neurosurgery. The book is happily free of typographical errors and it is provided with a well-compiled author-subject index.

JOHN F. FULTON

JAMES LEARMONTH. *The Contribution of Surgery to Preventive Medicine.* Heath Clark Lectures, 1949, delivered at the London School of Hygiene and Tropical Medicine. London, New York, G. Cumberlege, Oxford University Press, 1951. 55 pp. $2.50.

THIS publication comprises the Heath Clark Lectures of 1949 given at the London School of Hygiene and Tropical Medicine of the University of London. The lecturer is Regius Professor of Clinical Surgery and Professor of Surgery at the University of Edinburgh. The scope of these lectures includes, as specified in the deed of gift, "the educational, cultural and humanistic aspects (as opposed to technical and manipulate training) of the History, Development and Progress of Preventive Medicine. . . ."

Under this broad designation Learmonth has the opportunity of avoiding a discussion of the debt that surgery may owe to preventive medicine and undertaking the unique approach of discussing "what the ideal surgical outlook . . . has contributed and might contribute; and then . . . to conjecture the conditions under which any contribution of this kind can best be made." He states that "in the last two hundred years there has been much more than operating in the content of surgery," that he regards "surgery as a branch of biology . . . offering opportunities for contributions to preventive medicine."

This concept he supports by reference to John Hunter, who refused to confine himself within the "classical restrictions" to surgery and in doing so "freed others too—including Jenner—by his genius and by the stimulus, the encouragement and the guidance which he gave." This statement is certainly not excessive when one considers his activities and contributions in fields other than surgery, and those of his pupils. In Learmonth's mind the "directions for scientific endeavor" of Francis Bacon achieved their full fruition in John Hunter and exerted thereby a profound effect upon preventive medicine. In fact these, as given by the philosopher, are attributes which he thought himself to possess and that he believed made him peculiarly fit for the development of the particular epistemology upon which his distinction mainly rests.

However, one cannot help but be somewhat skeptical as to the degree to which Hunter was directly influenced by Bacon's writings—he like Paré was not given to scholarly pursuits but read nature at first hand. It is true that this was the essence of the Baconian approach to the acquirement of knowledge, but in fact it was in use before he formalized it and notably so in his own time and place by Gilbert and Harvey. The latter who knew him well said, "He writes philosophy like a Lord Chancellor." This critical interpretation may have contained within it the kernel of his success, for his stately prose and legal acumen lent an air of respectability and dignity to that which was already in the making.

Nevertheless, Learmonth's discussion of the "eight qualities which Bacon proposed and which Hunter employed" is instructive and stimulating. He considers these to underlie not only progress in the natural sciences but also in clinical and preventive medicine. This comprises nearly one-half the text, the remainder having to do with the "Contributions of Surgery to Bacteriology," "Surgery and the Broader Aspects of Prevention," and the "Future Contributions of Surgery."

In the first of these he opens the discussion with a consideration of Hunter's concept of what has come to be known as infection, based upon his *The Blood, Inflammation and Gunshot Wounds.* From this Learmonth proceeds to give a brief account of the developments in this field down to the time of Lister, largely the work of the Hunterian School, and notably

of Abernethy and later Paget. This is followed by a concise and accurate survey of Lister's contributions. Lastly he refers to the work in the seventies and the early eighties of Ogston of Aberdeen "on the bacteriology of acute pyogenic abscesses" of whom Bullock said that with the exception of Bruce "he was the only worker in England [*sic*] who now finds a permanent place in the history of pathogenic bacteriology in its classical period."

The second heading involves a discussion of the necessity for enlightenment of the public as to scientific accomplishments, in which surgery has an important part, for without this, preventive medicine finds it difficult to bring to a population the benefits that are potentially available.

The last lecture has to do with a more detailed statement of the part that surgery may take and the factors that condition its effectiveness. The first of these is that of obtaining as recruits those who have had a liberal and sound education, and are possessed of "some ability in making accurate observations and in relating these to the society in which the recruit is ultimately to live and to work. . . ." Those becoming surgeons have prospective spheres of activity which are related to the objectives of preventive medicine. Technical accomplishment in the broad sense, together with an attack upon localized disease, will in many instances prevent its generalization or its further progress. While doing this, the surgeon can accomplish much by minimizing the damage that may occur from his intervention, both local and general. Also, "when direct methods of dealing with a morbid process or with the threat of disease are impracticable or have failed, there are indirect methods which can be utilized," as in operations on the sympathetic nervous system or endocrine organs. In all this there is opportunity for advancement of knowledge, in which experimental surgery plays an important part.

While the immediate objective of surgery is the cure or palliation of disease in the individual, this when cumulative in the population as a whole is closely related to preventive medicine. And the objective is "to conserve and to preserve the young and active, so that they can put their strength and vigor at the service of the community, and to preserve the old, so that they can put their experience to similar use." In this the more recent development of the concept of "Rehabilitation"—which the author terms with some justification a clumsy title—gives great promise. No less important are the prevention of injuries and the "prompt recognition and prompt correction of common surgical conditions." As to the latter, he comments that "to my mind, the extent to which this objective is achieved will provide a reliable index of the success or failure of the National Health Service so far as surgery is concerned." It might be added that this statement is equally pertinent to preventive medicine.

New Haven, Connecticut SAMUEL C. HARVEY

JOHN F. FULTON. *The Great Medical Bibliographers. A Study in Humanism.* Philadelphia, University of Pennsylvania Press, 1951. xv + 107 pp. illus. $4.00.

THE work under consideration comprises three lectures given in February 1950 on the A. S. W. Rosenbach Fellowship in Bibliography at the University of Pennsylvania, and now in their printed form accompanied by critical apparatus, bibliographies, and illustrations. The author, Sterling Professor of the History of Medicine in the Yale University School of Medicine, has long been recognized as a notable collector and bibliophile and a bibliographer of no small repute. He is therefore excellently qualified to present from the lecture platform and through the medium of the printed page his considered judgment upon "great medical bibliographers." Thus his book represents a selection, that is, a study of those medical bibliographers whom he considers to be great. In short, it is not meant to be encyclopedic, and if the name of any particular bibliographer is missing, presumably it is because Dr. Fulton did not consider him as one of the more notable ones.

The first lecture traces the development of bibliography from those lists of his own writings drawn up by Galen in the second century, through later bibliographical writings, hardly medical but necessary for tracing the general development of the science, to Johann Tritheim, called by some "the father of bibliography" and thence to Symphorien Champier and so into the main subject of the work. It is perhaps as well to say at this point that the book is written with a genial charm and a pleasant informality which extends to form as well as to diction. Thus from Champier it is not difficult to wander off the main route into pleasant byways. Champier suggests Dolet who seems somehow to lead on to Rabelais. Some of this material does not, of course, square with the title of the book, but this is of little moment since the author in his capacity of medical bibliographer enriches his discussion from his large store of bibliographical knowledge and even finds time to stop and present a graceful tribute to the late Edward C. Streeter, bibliophile and student of the Rabelaisian circle at Lyons as well as an important influence upon the development of the present author's interests in such matters. The first lecture ends with a relatively extensive and warmly appreciative consideration of Conrad Gesner, like Tritheim frequently called the father of bibliography. Here, of course, the major concern is with his *Bibliotheca universalis,* although Gesner's other writings are given some consideration. Gesner was apparently a rare soul loved by everyone, not only his contemporaries but even by those of today who are familiar with his writings. His English friend John Caius writing his *De libris propriis* remarked:

> [Gesner's] unexpected death a short time ago on the ides of December in the year 1565 so affected my spirit that time, which usually relieves the most bitter sadness even in women, has not yet lessened my grief over him; rather it has increased gradually by

more and more contemplation not so much because of the affinity of spirits which usually occurs in very close association . . . [but] because of his most splendid character, his rare understanding and infinite reading; for which reason not only did I single him out but loved him greatly.

It may incidentally be mentioned that Dr. Fulton's failure to include Caius' little book, a rather important bibliography of his own medical works, and to a lesser degree of those of others, was no doubt due to the exigencies of limited lecture time, but mention of Gesner's *Historia animalium* ought perhaps to include the fact that Caius supplied him with information on various British animals, wrote his account of British dogs principally for Gesner, and drew up a list of his own writings at Gesner's request, presumably as an aid in the compilation of his *Bibliotheca.* And one wonders just how extensive was this last practice. Did compilers of such *bibliothecae* and bio-bibliographies normally apply to biographers for such information?

The second lecture deals with booksellers' and auction catalogues as bibliographical tools and pays more attention to the more important medical collections which have been recorded in this fashion, such as those of Riolan, Sir Kenelm Digby, Sir Thomas Browne, and Francis Bernard. Much of the Bernard collection, as Dr. Fulton ascertained, was purchased by John Trotter of Edinburgh and was preserved intact by the later generations of the family until 1947. Incidentally, it was Charles, the brother of this Francis Bernard, and like him a collector, who first called to the attention of William Wotton the significance of the celebrated passage on the circulation of Servetus' *Restitutio christianismi* and so led to its inclusion in Wotton's *Reflections upon ancient and modern learning.* The author continues his lecture with a consideration of the bibliographical work of J.-A. van der Linden, Cornelius à Beughem, and a more extensive consideration of the great Swiss bibliographer Albrecht von Haller. With the advance of the eighteenth century encyclopedic works became the order of the day: Denis Diderot and the *Encyclopédie,* Eloy and his *Dictionnaire historique de la médecine,* which properly is given high praise, and various others. Here Voltaire's anecdote respecting the king, Mme. de Pompadour, the Duc de la Vallière and their need for the *Encyclopédie* which had been suppressed by royal edict, while acceptable as to spirit, factually does not seem fully supported by a comparison of dates. Perhaps, too, in considering the medico-bibliographical efforts of Diderot one might call attention to the Vesalian plates in the supplementary volumes of the *Encyclopédie.*

The final lecture takes up the matter of bibliographical arrangement and subject indices, in particular the efforts of John Shaw Billings and Ludwig Choulant and finally the rise of the personal bibliography as exemplified in the writings of Geoffrey Keynes. It is here that some criticism can be made of the author's selective judgment, while at the same time it is apparent that the fault lies in a commendable but too great modesty. Certainly in the field of what is termed "personal bibliography" Dr. Fulton's consider-

able and important bibliographical studies merit attention if we are to avoid a distorted picture.

The text is followed appropriately by bibliographies: the editions of Gesner's *Bibliothecae;* a list of catalogues of early medical sales in England and Scotland; the bibliographical writings of Haller, Choulant, and Geoffrey Keynes; finally there are thirty-seven facsimiles of title-pages and portraits illustrative of the history of medical bibliography from Tritheim to Keynes. Unlike so many addenda, these are related and important adjuncts to the text.

Dr. Fulton has performed the double task and rôle of expositor upon medical bibliographers and that of bibliographer himself. In both of these he has been eminently successful and is to be complimented upon the production of a soundly informative work which has the perhaps unusual distinction of being thoroughly readable at the same time.

Stanford University, California CHARLES D. O'MALLEY

JUDSON B. GILBERT. *A Bibliography of Articles on the History of American Medicine compiled from "Writings on American History" 1902-1937.* New York, New York Academy of Medicine, 1951. viii + 44 pp.

BIBLIOGRAPHIES are important research tools. For a number of years the American Association of the History of Medicine has published an annual "Bibliography of the History of Medicine of the United States and Canada." Dr. Gilbert, the compiler of the bibliography reviewed here, felt that a wealth of material existed in non-medical sources, and he set out to compile them from the early volumes of *Writings on American History* and the Griffin series of the American Historical Association. The bibliography was completed at the time of Dr. Gilbert's death in 1950, and has now been issued in the History of Medicine Series of the New York Academy of Medicine. The items are classified under the headings and order of the "Bibliography of the History of Medicine of the United States and Canada," which it actually supplements. Dr. Gilbert's compilation will be found very useful by students of medical history. It is available from the New York Academy of Medicine.

New York, New York GEORGE ROSEN

ASHBEL SMITH. *Yellow Fever in Galveston, Republic of Texas, 1839.* An Account of the Great Epidemic. Together with a Biographical Sketch by Chauncey D. Leake, and Stories of the Men who Conquered Yellow Fever. Austin, University of Texas Press, 1951. xvii + 135 pp. $2.50.

THE reader will find much of importance and interest in this little book, which contains not only Dr. Ashbel Smith's reprinted description of the great yellow fever epidemic in Galveston, Texas, in 1839 and a biographical

account of Dr. Smith's remarkable life, but a series of short articles, mostly by the late Josiah C. Trent, dealing with achievements of leading figures who shared in the conquest of yellow fever. For this compendium, the editor, Dr. Leake, deserves signal credit.

At the risk of transcribing too much of the book's contents, it might be noted that of Dr. Ashbel Smith himself, we learn at the start (more from the text than the frontispiece) that he "was a small man, with a rather ugly face, further disfigured by a beard." But despite or even because of these attributes, he emerges from this book as a remarkable person and an heroic figure in the early history of Texas. Originally a Connecticut Yankee, who secured his bachelor's degree from Yale in 1824, he first tried law, then medicine, and practised both professions for a while in North Carolina. Next he was drawn to the new frontier land of Texas where he became in 1837 first Surgeon General of the Republic of Texas, and subsequently, Secretary of State, first Minister of the Republic of Texas to England and France, Representative and Senator for Texas, Colonel in the Civil War, in which he was wounded at Shiloh, and a founder of the Medical Branch of the University of Texas at Galveston.

Early in this busy life we can see him, in 1839, confronted with the Galveston yellow fever epidemic. It must have been a bitter blow to the new city of Galveston when it was scarcely two years old and already boasted of a population of "2000 to 2500 souls," that it should have been afflicted by such a deadly pestilence. According to Dr. Smith, Galveston Island at that time and the city itself comprised an area whose "general healthfulness is probably unsurpassed by any place in the world." The dreadful visitation of the yellow fever must have been terribly disconcerting. But he seems to have done all and more than would have been expected of a mid-nineteenth century "general practitioner," which means that he became physician, pathologist, comforter of the people, epidemiologist, public health official, and future medical historian, all packed into one little man. It was at a time when New Orleans and other Gulf Coast cities had sustained epidemics of this terrible and mysterious malady, but it was some sixty or more years before the mosquito transmission of yellow fever was to be recognized.

Since the late eighteenth century or before, American physicians had felt that they *must* explain to the public where this terrible disease came from, and how it was spread. They were under duress about this and since the time of Benjamin Rush, and before, had evoked all possible kinds of environmental influences: geographical, meteorological, and otherwise, ranging in fact from thunder storms to spoiled coffee. Dr. Ashbel Smith must have pondered these questions but he did not give any omniscient pronouncements as to the origin of yellow fever. He turned his attention to the welfare of the city and his patients. His clinical description of the disease and his observations on the pathology of the disease merit close

attention. The latter were based on his having performed seven autopsies. An important lesion to him was that of scattered tiny hemorrhages found in the gastric mucosa which gave rise to "the black vomit," which, he says, he had tasted many times in an effort to understand its nature. In his 25-page report of the epidemic are 31 case reports, 10 of them fatal, and in most of the latter the autopsy protocols are transcribed.

Also in this volume are a series of short but highly informative accounts of investigators who contributed to the history of yellow fever. The reviewer would make one comment about them: namely, that Dr. Carlos Finlay of Havana should perhaps be given a little more stature in this story than he appears to have received. It should always be remembered that Carlos Finlay provided Walter Reed with information as to the particular type of mosquito on which he might do his tests. This enormously simplified Major Reed's problem.

New Haven, Connecticut JOHN R. PAUL

HIPPOCRATES. *Hippocrates on Intercourse and Pregnancy.* An English Translation of On semen and On the development of the child by Tage U. H. Ellinger. With an introduction by Alan F. Guttmacher. New York, Henry Schuman, 1952. 128 pp. $2.50.

HIPPOCRATES, according to Professor Ellinger, was not the writer of *On Semen* and *On the Development of the Child,* the two works here offered in translation. The unknown author has nevertheless presented an interesting interpretation of aspects of the physiology of human reproduction, heredity, and embryology as they were understood in the fifth century B.C. A theory of sex determination is set forth. A connection between the reproductive tract and the central nervous system is recognized. There is a foreshadowing of Darwin's "pangenesis," and an explanation for fetal abnormalities. Emphasis is on the reasoned interpretation of observed phenomena.

The value and interest of the translation are much enlarged by the excellent commentary of Dr. Alan F. Guttmacher, who also wrote the introduction. The printing and binding are attractive. There is no index.

New Haven, Connecticut THOMAS R. FORBES

GEORGE WORTHINGTON ADAMS. *Doctors in Blue. The Medical History of the Union Army in the Civil War.* New York, Henry Schuman, 1952. xii + 253 pp. $4.00.

DR. ADAMS, who is Dean and Professor of History at Colorado College, has written a highly readable and human story of the medical history of the Union Army in the Civil War. In 1861, the Army Medical Department, headed by octogenarian Thomas Lawson, consisted of some ninety-eight officers with a headquarters personnel of eight individuals to administer

its affairs. The organization of the Sanitary Commission under the able secretaryship of Frederick Low Olmstead was effectual in bringing some order out of the chaos which existed in the Department under the impact of war, and the Commission becomes an important influence for reform.

In an interesting chapter, Wartime Surgery, are discussed wounds as reflecting the type of warfare. Bullet wounds accounted for 96 per cent of all wounds in nearly a quarter of a million patients of whom 14 per cent died. The experience with anesthesia was extensive; some 80,000 general anesthesias are supposed to have been given, 76 per cent of which were chloroform.

Army sanitation and hygiene were at almost unbelievable levels compared to modern practices. Typhoid and intestinal diseases had an enormous incidence, the former being the leading "killer." Nevertheless, the medical and sanitary record must be considered on the whole good for a day and age when bacteriology and aseptic surgery were still unknown.

The administrative reforms under the Medical Department were of greatest importance. The ambulance and field-relief systems, the use of women as hospital nurses, the relief commissions supplied by the civilian population were developments which have gone on to places of high importance. On the basis of the latter was to arise the American Red Cross.

It was through Army experience too, that American doctors for the first time began to exercise control in large general hospitals—probably the true beginning of systematized effort in hospital care in the western world. *Doctors in Blue* is a fine addition to the history of the American Civil War and an important contribution to the medical history of that war.

New Haven, Connecticut HERBERT THOMS

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